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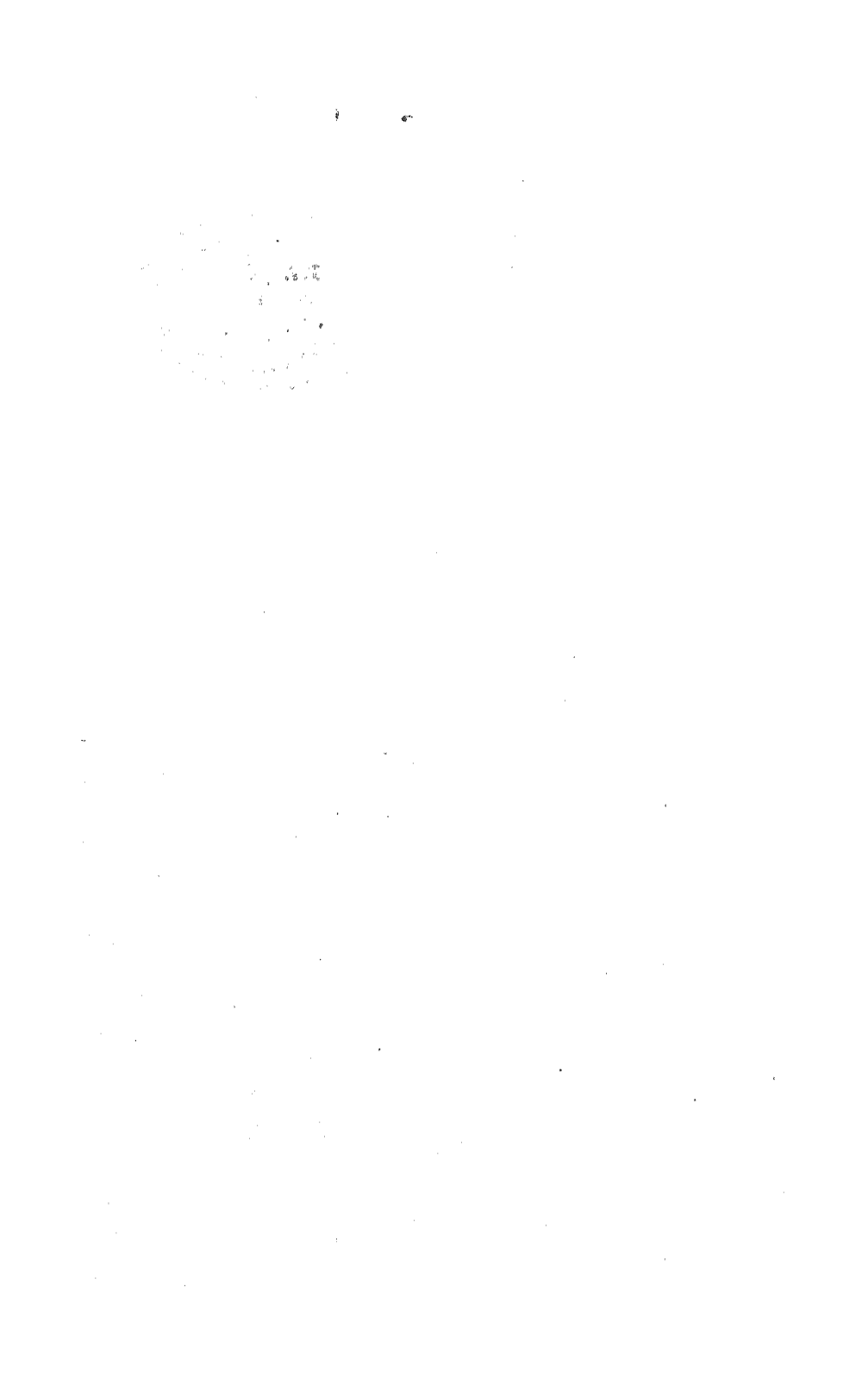


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NOTES.

IMPORTATION OF FRUIT TREES.—During the first three weeks of the present month the returns of the importation of fruit trees constituted almost a record for this State. During the period under review 53,089 trees and plants were imported; of these 33,062 were apple trees. For the month of May 3,405 fruit trees were imported, of which 530 were apple, making a total of 33,592 apple trees for this season. The annual importation of apple trees alone for the previous five years was as follows:—1896, 44,520; 1897, 14,862; 1898, 7,315; 1899, 36,920; 1900, 34,301. These totals, together with this season's importations, make a grand total of 171,510 apple trees, which, when planted, will, it is stated, cover an area of 1,715 acres. These figures do not include the trees, amounting to several thousands, obtained from the local nurseries.

IMPORTATIONS OF FRUIT.—A return of all fruit imported into West Australia, and inspection fees received thereon from January 1st, 1898, to May 31st, 1901, has been prepared by the Department of Agriculture. At the commencement of the period referred to the schedule of inspection fees was reduced, and the reduced rate is still in force. The return shows that between the dates mentioned 126,303 cases of fruit have been received and inspected at the various ports. The sum of £2,952 11s. has been collected as inspection fees, and paid into general revenue. The percentage of fees per case is, therefore, a fraction less than $5\frac{1}{2}$ d., and estimating the average case to contain 40 lb. of fruit, it will be seen that the charge for inspection at the ports— $\frac{1}{4}$ of a penny per lb.—cannot be fairly blamed for increasing the price to the consumer. As the whole amount of inspection fees received are paid into the general revenue, it will be seen that the Department of Agriculture has to bear the cost of providing the necessary accommodation for unpacking and repacking, the chemicals and appliances for disinfection, as well as the supervision of the Inspectors, without in any way benefitting by the fees charged.

INSPECTION OF ORCHARDS.—The following is the general report of the Department of Agriculture on the inspection of orchards under the Insect Pests Act, for the period from May 18 to June 1:—“The Inspectors under this Act have examined 55 orchards during the fortnight. Particular attention is being given to the examination of those orchards in which the San Jose scale has been found during former inspections; also those not formerly examined. Of the orchards inspected, 12 were found to be infected with this pest, the number of trees affected aggregating 53. In eight of the infested orchards the scale was known to have existed formerly, and in the remaining cases the disease has apparently spread from trees affected in the same neighbourhood. The des-

truction of 18 trees infested with San Jose scale has been ordered, and in the remaining cases the adoption of eradicating the scale by means of fumigation with hydrocyanic acid gas has been allowed. In all cases the owner or person in charge of the infested orchard has received instructions to proceed at once with what action is prescribed: In the case of a grower at Midland Junction, who persistently disregarded the orders issued to him to eradicate woolly aphis from his orchard, it has been found necessary to grub out and burn 12 apple trees severely infested with that disease."

FRUIT PRODUCTION.—On the subject of the prohibition of the importation of apples, a fruit-grower residing near Albany has forwarded the following letter to the Secretary of the Department of Agriculture. The request contained in the letter has been acceded to:—"Sir,—As you are doubtless aware, the Perth daily papers have for some time past been agitating for the removal of the prohibition on imported apples, and the subject is likely to come before Parliament in the near future. As this is a very important matter for all fruit-growers, I would suggest that the various horticultural societies draw up petitions in favor of the retention of the prohibition, and in this I should be glad of your assistance. If you would kindly insert a notice in the Department's JOURNAL, I have no doubt that the various societies will take the matter up. The papers have taken a one-sided view of the case, quoting the highest retail price in Western Australia after the main crop is over against the slump wholesale prices in the Eastern States. The papers also do not mention that the cause of the high prices this year is the partial failure of the crop. With the vast acreage of fruit which is coming into bearing within the next year or so, fruit will be cheap enough without imported apples. In any case, allowing the codlin moth to get a hold in this State, should not be done without both sides of the question being fully considered by Parliament."

VALUE OF BRAINS IN AGRICULTURE.—The Agricultural Education Committee of London has published a pamphlet entitled *The School, the Farm and the Garden*. One paragraph headed "The value of Brain," states: "It is generally admitted that superior education is the cause of Danish success in the dairy; or, as Mr. Thornton put it in his report, 'The Dutch butters, like Opie's colors, are good because they are mixed with brains, sir.' This means in hard fact about £8,000,000 paid to Denmark annually by England, because, though we have as good a climate and probably better cows, our dairymaids are not so clever and skilful. Or, to take another instance, a few years ago our importation of Danish eggs was insignificant; now it reaches nearly three-quarters of a million per annum. Meantime our agricultural classes complain of semi-starvation. The poorer

of them turn their backs on the land and go to the towns. Such as remain find country life so tedious and dull that they take no interest in it. No other markets in the world are equal to those of England. In 1899 we paid the unprecedented total of £184,584,796 for agricultural products, a great deal of which came, not from the virgin soil of new countries, but from France, Denmark, and Russia, that possess no natural advantage over us. With the markets almost at their elbows, our farmers can scarcely make a living; their servants are ill-paid and discontented, and the land has gone down in value."—*Town and Country Journal*.

WATER SUPPLY MADE EASY.—It was at one of the minor agricultural shows in the heart of Riverina, about three years ago, we were first attracted by one of those ingenious machines called an Ericsson hot-air pumping engine. On inquiring why such a new and up-to-date piece of machinery was exhibited at a far inland show before its existence had been recognised in the metropolis, we learned that this particular little engine had lately been imported direct from America by an enterprising gentleman in the district. Since then the Rider & Ericsson hot-air pumping engines have made their way steadily and quietly, and to-day are greatly appreciated by users in all parts of the States. The numerous letters we have seen from representative gentlemen, giving highest testimony to the excellence and efficiency of the engines, bear this out. We do not pretend in this article to give a full description of the engine's construction and the hot-air system of working, suffice it to say that the only thing necessary to make the engine work is the application of a simple fire, and no more than will be found in an ordinary cooking stove. There is no danger of an explosion, and any person can work the engine. There are no complicated parts to get out of order, the amount of fuel and attention required are infinitesimal, and with reasonable attention the cost of up-keep is acknowledged to be less than for any other engine made. When we reflect on all the difficulties and worries connected with water-lifting, procured for various uses, the primitive and costly methods employed by so many settlers in the far out-back paddock and homestead, we realise at once what an immense boon such a simple contrivance must prove itself, and how well it fills a want which it is to be regretted has not been supplied long ago. Now, the enterprising settler who invests in a Rider or Ericsson hot-air pumping engine can water his stock either from well, creek, river, or dam, supply his house and homestead, water his orchard and garden, lucerne paddock, or for a dozen other uses raise the precious fluid with an easy mind and joyous heart. But the uses of these machines are not confined to alleviating the sufferings of the much ill-used man on the land, as they are equally valuable in draining small mining shafts, cyanide pumping, gold sluicing, etc.—*Sydney Mail*.

POSSIBILITIES OF TROPICAL AGRICULTURE IN THE NOR' WEST.

THE BEAGLE BAY MISSION EXPERIMENTS.

BY DAISY M. BATES.

In 1897 Mr. R. Helms, who, at that time was Biologist to the Department of Agriculture, made a visit to East Kimberley, and in an extensive report, which was subsequently published in the JOURNAL in June numbers of the same year, gave a most graphic account of the possibilities of tropical cultivation.

In order to furnish a true report of the prospects and work of the Trappist Mission at Beagle Bay to a section of the English public, in September of last year, by the kindly invitation of Bishop Gibney, I accompanied him and the Very Rev. L. M. Martelli to the Mission, situated some 1,600 miles due north of Perth. The Mission having been started about ten years ago, it may be of interest to the advocates of tropical agriculture to be made aware of the results of the missionaries' labors in the growth of fruits, cereals, etc.

About 75 acres of land surrounding the Mission was cleared for cultivation, and upon this land the experiments were carried out, with what success will be seen below.

Seeds and plants were obtained from Europe, Singapore, and the Agricultural Department of this State. These were carefully planted, and the results after ten years' work are thus set forth:—

Bananas, being the most successful of all the fruits grown, claim first attention. I counted upwards of 8,000 plants and shoots, all the grown plants fruit-bearing. The Abbot informed me that he had 13 varieties of this plant, all in the highest state of excellence; some of the plants were upwards of 15 feet in height. I tasted many of these bananas, the delicate and luscious flavour of most of them being perfectly delicious. The gardens in which they are grown are marked out in spaces about 15 feet apart, and trenched between every two rows. As there are numerous springs in the gardens a constant stream of water flows through the trenches. In the earlier stages of their growth vegetables are sown between the rows, but as soon as the plants begin to bear fruit the space between is left clear.

The trees are very prolific, on one bunch alone Father Martelli counted 150 bananas, and that number we were told was by no means unusual. Altogether banana culture is one of the chief successes at the Mission.

There were 52 cocoanut trees planted, but these trees taking from eight to ten years to attain maturity, only three were fruit-bearing. We had the pleasure of opening the first cocoanut grown at the Mission, and found it an excellent specimen of what promises to be a very lucrative industry. I do not think there is sufficient



A GARDEN, BEAGLE BAY.
(See opposite page.)

space left between the cocoanut trees, which may materially affect the fruit-bearing capacity of some that were planted about six years ago, but at present all the trees are healthy and most promising.

The date trees, 60 in number, were planted about the same time as the cocoanuts, and also taking eight or nine years to come to maturity, seven only are fruit-bearing. I believe the date trees should be planted in groups, as the male and female flowers are developed on separate trees. The fruit had not come to maturity during our stay at the Mission, though it looked strong and healthy, so I am unable to state whether it ever arrived at full fruition, but in the case of a male tree not being present the female cannot be fertilized, and the fruit would drop off without ripening.

I have written to the Abbot for further information on this subject.

Pineapples were growing successfully, and many of them were ripening on our departure from Beagle Bay.

Of fig trees there were not many sown—about 20—but all were carrying fruit, and there were six young orange trees doing very well.

The castor-oil plant grows abundantly, and Father Martelli, who spent many years in India, states that the seeds obtained at the Mission are equal to the Indian product, so that the oil may become an article of commerce.

The pomegranate trees were flourishing, also the papaw, the fruit of which has a most delicious flavour. When green this fruit can be used as a vegetable for soups, etc.; it is then not unlike the marrow in flavour.

Rock and water-melons grow in abundance; Cape gooseberry thrives wonderfully well; sugarcane and sorghum are also grown, and are highly successful. A very pleasant drink, which we called "Beagle Bay Beer," is made from the cane, sugar and water being the only other ingredients, making a good thirst-quenching beverage. The sorghum is principally used for horses and poultry feed, but in time it may be grown in sufficient quantity to take the place of rice at times as a food for the natives, the absence of proper machinery for crushing, etc., alone preventing its being more extensively cultivated than at present.

Rice has been sown in the swamp lands, and when practical men take its cultivation in hand will go far towards making the Mission self-supporting, as the food of the natives consists mainly of rice and pumpkins.

The specimens of arrowroot which I brought with me from Beagle Bay were pronounced by a Queensland expert to be better than the best grown in that State. The need of machinery for its manufacture is the only reason why it is not more extensively planted, but it is proved that the soil is eminently suited for the growth of this plant.

Tobacco-growing on a more extensive scale than obtains at present will also be undertaken as soon as an expert in its growth

and curing arrives from Europe. At present it is grown in small quantities, but has not been manufactured into the finished article owing, I understand, to the fact that rum is required in some stages of its manufacture, and at present there is no means of making rum at the Mission.

As regards vegetables, Beagle Bay might be called a Chinaman's paradise. Firstly I must take the English potatoes, which are as good as any I have eaten in England or Ireland, large, well-developed, fine "floury" potatoes, which will easily find a market in the various towns along the coast, where now, at most of the hotels in the Nor'-West, you are given a Singapore product, misnamed potato, about the size of a marble, waxy and unpalatable.

Large sweet potatoes, "taro," an excellent kind of vegetable somewhat resembling the potato, and growing in the garden trenches, pumpkins, cabbages, lettuce, tomatoes, chillies, cucumbers, onions, eschalots, peas, beans, one long variety measuring about a yard in length—not the seven years bean I am told, but another kind—radishes, carrots, and parsnips, all these grow abundantly and are the best of their kind. Many of the pearling boats come regularly into Beagle Bay in order to obtain a supply of these vegetables.

The district is well timbered, cadjeput being the principal. This tree resists to a greater extent than any other, not excepting jarrah, the ravages of the white ant, and has been extensively used in the Monastery buildings. Eucalyptus, acacia, banksia, paper bark ti-tree, and a tree the natives call "kurra-burra" which has large seed-pods, the seeds rivalling the almonds in flavour—all these trees grow in the district. Occasionally, but not often, a "willy-willy" visits the country round the Mission; two years ago a very severe monsoon destroyed two sides of the quadrangle then forming the Mission buildings, but the country being so well and thickly timbered, the local storms are neither frequent nor destructive.

At Disaster Bay the monks had planted some bamboos of an Indian species, those I saw growing were from 12 to 15 feet in height.

I notice in the June (1900) number of your JOURNAL that some seeds of the *Kicksia Africana*, a species of rubber tree, were sent to the Mission at Beagle Bay for experimental purposes by the Agricultural Department, but I did not hear of their having been planted, nor of their having been received. They may have been lost in transit, or they may have been received just at the time some of the monks were leaving for Europe, those who filled their places probably overlooking the packet. An experiment with any species of *ficus elasticus* is well worth trying in view of the fact that owing to the reckless destruction of trees rubber is yearly becoming more scarce.

There are about a thousand head of cattle on the Mission run, and I noticed that those occupying the marsh lands were fatter and

much better looking than the herd that keep to the "pindan," or bush lying between Beagle Bay and Disaster Bay, within the Mission reserve. The working bullocks would take a prize at any show in the States.

The country does not seem at all suitable for sheep, all those on the Mission land being very poor and weedy, and not averaging above 30lbs. in weight, and with very scanty wool. Where there is plenty of food and water it must follow that either the quality of grass is unsuitable for sheep, or the conditions of the climate do not admit of sheep thriving in these parts.

Horses do not fare well either. Many losses have been sustained by the monks, owing to the prevalence of a poison plant, which causes much mortality among the horses. The monks planted several acres of couch grass for horse paddocks, and have by this means mitigated the risk. I have been told that the first and succeeding generations of horses born on the place successfully resist the poisonous grasses, and become hardy and strong. Timor ponies seem to thrive best at Beagle Bay.

A short description of the fauna of these regions may prove of some interest. The fauna to be met with between Beagle Bay and Disaster Bay comprise three species of kangaroo, two species of scrub and rock wallaby, a rather undersized opossum of the silver grey variety, a species of kangaroo rat (locally called bilbi, having beautiful fur almost of the fineness of texture of chinchilla), some rather large flying foxes, and a few smaller kinds of bats, which I noticed flying about the Monastery in the twilight. The *avi fauna* were in great variety. At one of the springs which we reached before sunrise one morning, at the sound of our voices thousands of birds of all kinds and varieties flew up into the air, screaming with every kind of voice at their disposal. Wild turkeys, cranes, ibis, native companions, doves of different species, cockatoos (white and black), parrots and parroquets, and innumerable smaller birds, all gave vent to their feelings of anger at being disturbed, and those of them that did not at once fly away rested on the branches overhead and continued their protest during our breakfast. As a rule birds of a different species keep together. I have seen thousands of native companions holding a sort of Hyde Park demonstration on the margin of swamps, and I have disturbed numerous flocks of white and blue cranes in my passage over the marshes. Several species of duck and pigeon abound in those regions, the Java sparrow also in great numbers and many varieties. Small kingfishers and many other bright plumaged birds frequent the gardens, the bee-eaters rendering bee-keeping an impossibility, as every hive obtained is devoured in a very short time by these little pests. A kind of plover and quail, though not much resembling the home species, was also to be met with, and one of the pheasant tribe called "gnau" pleasant to the taste and of a delicate flavour.

One evening on our way to the Mission I came upon numbers of little holes in the sand, and one of the natives telling me they were the nests of some birds, I had one of the holes opened and

found the distance from the opening to the little nest where three tiny king-fishers lay to be seven and a half feet in length ; how the parent bird with its long thin bill could make such a round shapely tunnel is a mystery, even though the tunnel is bored through sand. A " worallul " and " geroul-geroul " two birds somewhat resembling the butcher and giant kingfisher were brought me by the natives but the difficulty of bringing them away from Beagle Bay was too great, and so I had them returned to their nests.

Of reptiles generally we did not see very many. I caught a frilled lizard and killed and skinned it ; many smaller ones hunted the ubiquitous fly along the walls of the Monastery or lay about the roots of blackboy. Some large tree lizards were killed between Beagle and Disaster Bays, and many species of snakes—the black snake about five or six feet in length, a few spotted and ringed ones from two to three feet, and one very small species that the natives seemed very much afraid of, saying its bite was fatal in a few minutes. Man eating alligators swam in the creek which ran into Disaster Bay ; we saw many of them in the water but did not wait for a closer view. At the same place we witnessed the gambols of that curious little creature the mud-fish : they swarmed on the banks of the creek at ebb tide, jumping about the mud like frogs, and propelling themselves by the aid of their fins and tail, forming a wide inverted " U " in the act of jumping. We tried to catch some, but they disappeared through the mud in an instant.

Several species of fish abound in the waters of Beagle and Disaster Bays.

A species of wild bee, stingless, and smaller than the house fly, builds its nest in the piped branches of the white gum, and collects a most delicious honey, having a very curious and attractive flavour, totally unlike any wild honey that I have ever eaten. It is very difficult to find the nests of these little insects, the opening being so small. The manner in which the natives discover the nests is by looking on the ground underneath the tree for any dead bees that may have fallen out of the nest, and as the bees are very very small, the native has to kneel down and look closely among the grass and dead leaves until he finds what he is seeking. The branch is then cut down and the honey bees and wax eaten *holus-bolus*.

One of the greatest blessings in and around Beagle Bay is the abundance of water. There are no watercourses, but numerous springs are to be found. Between the two bays the country is almost level, only dotted here and there with curious little mounds covered with screw-palms and acacia. These mounds are really springs, the water having forced its way from some subterranean source until it found an outlet. We did not find any of these springs further than fifteen miles inland from the coast.

Many of these springs have been opened out and troughs fixed round them for the use of the stock. With the aid of the native women I set to work and made a well about seven feet square and between eight and nine feet in depth. We finished the

work in a few hours, and next morning the water was level with the embankment which we had formed from the soil taken out of the well. The water in these springs is constantly in motion, and always keeps a certain level. Therefore, when the troughs are placed in a position slightly below the level of the wells, the water flows into them and they are always kept filled by the overflow from the well. In this way the water in the trenches is constantly in motion, and the banana and other gardens "supplied with fresh water daily." There are four gardens attached to the Monastery, including the "banana nursery."

And here, before I close, I cannot help mentioning a circumstance in connection with the outlying station at Disaster Bay, and our visit there across the "pindan," which, more than anything else that I witnessed, redounds to the credit of the natives in that district. This out-station had not been visited by the monks for over six months before our arrival. The sugarcane and melons and other fruits that had been planted there had grown and come to maturity. There was also kept in the house a supply of food; rice, tea and sugar, and a little flour, the door was not locked, the food was easily getatable, the natives knew it was there, they are also passionately fond of sugarcane, and yet, though they passed by that house many times during these months, and though they were well aware that the monks would not inflict any punishment, for their teaching is to conquer by love, not fear, yet not one stick of sugarcane was touched, and the food in the house was left intact. I mention this fact because it came under my own observation, and because, without having seen it, I should scarcely have credited the assertion that the natives could know there was food within reach and yet refrain from touching it out of regard for, not fear of, the missionaries.

It will be seen from the above account of the products of Beagle Bay what facilities there are for enterprising settlers in that part of the Nor' West. That the climate is trying I admit; still it is livable. I was up there during some of the most trying months—August to the end of November—and in the latter part of our stay the thermometer at times registered 110 in the shade, hot winds occasionally aggravated that heat, some days there was not a breath of wind, yet we could endure the heat and pursue our work until the end of the month brought us into civilization again.

Anything that will bring farmers into closer social intercourse is worth far more than it costs. Good country roads will help vastly to accomplish this desired end. In the best farming portions of the country, when it is too wet to work in the fields, it is too muddy for visiting. Farmers have too long suffered from isolation. When two men meet and commune on matters of interest to each, both are invariably benefited.

VISIT TO BOYUP BROOK.

Mr. P. Wicken, Field Officer, reports to the Secretary of the Department of Agriculture on his recent trip to Boyup Brook as follows:—In accordance with instructions received I have paid a visit to the Boyup Brook Agricultural Society for the purpose of giving some instructions in the pruning of fruit trees.

Leaving Perth on Tuesday, June 18th, I arrived at the Brook on the following day. On Thursday, June 20th, accompanied by the Secretary of the Society, I drove over to Mr. Dixon's orchard and farm, and pruned several trees of different varieties of fruit, and gave some instructions on other matters and returned in the evening.

On Friday I met a number of settlers at the Secretary's orchard, and gave a lesson in pruning to a number of visitors and pruned a number of trees, later on I visited the orchards of Mr. Williams, the President of the Society, and also of Mr. Stanton.

On Saturday I visited the farms of Messrs. Barron, Wild, Vincent and Brooks, and pruned a number of trees and vines at each place, and gave information on a variety of subjects.

In the evening I gave a lantern lecture at the Public School showing slides of the land we live in, which was, I think, attended by the whole population, and was much appreciated. A vote of thanks was passed to the Department and the lecturer for the entertainment. I also gave an exhibition of vine pruning at the residence of Mr. Abel, and also pruned a variety of other trees.

On Monday I left for Bridgetown, going by Mr. Inglis' farm on the way, where I pruned a number of vines and trees. I arrived at Bridgetown at 4 p.m., and in the evening I gave a lantern lecture in the Mechanics' Institute in that town, showing slides of the "Land we live in." The lecture was well attended and much appreciated. The usual vote of thanks was passed.

On Tuesday, June 25th, I returned to Perth.

The instruction in pruning asked for in this district was badly needed, and I think some good will result from my visit. Some of the settlers have a very good idea of pruning their trees, but their vines are in a very bad way, and I pruned a number for them to copy, and hope they will do so, but in most instances the trees are in a very bad way. The greatest fault lies in the fact that they have never been cut back since they were planted, or after having been received from the nursery. The trees, having never been formed, have grown all manner of shapes, with long centre limbs and the branches growing any way. It is rather a hopeless task to deal with such trees, the only remedy being to cut right back, and thus lose two year's growth. However, I did the best I could, and have shown them how to cut the young trees back in future.

A good area of land is being put under cultivation in this district, and all the settlers are planting out a number of fruit trees. So far the season has been a very favorable one, and the crops promise well.

VISIT TO YARLOOP.

Inspector Jefferson, in an interesting report to the Secretary of the Department of Agriculture on the orchards in the Yarloop and Cookernup districts, writes:—There are several promising young orchards in these districts, that of Mr. John McEwan of Glen Ewan being particularly noticeable. The trees, which cover an area of eight and a half acres, are from two to four years old, and in consequence of having been correctly planted and pruned, and kept free from disease, have made wonderfully good growth. While all kinds of trees have done well, the palm may fairly be given to the apricots, which have made surprising headway. Mr. McEwan has also planted half an acre of passion vines, which have done extremely well, there being scarcely a miss in the whole plot.

Another interesting feature of the Glen Ewan orchard is a small patch of *paspalum dilatatum* which has thriven most vigorously. Mr. McEwan is so pleased with the growth of this excellent fodder plant that he intends to lay down a few acres with it during the present season.

Altogether the Glen Ewan orchard is an excellent advertisement for the district, as well as bearing eloquent testimony to the energy and up-to-date methods of the owner.

The orchards of Mr. J. Woodley and Mr. J. Thomson Logue are also most promising, and provide splendid illustrations of the productiveness of the soil in the South West when properly cultivated.

INTRODUCTION OF LADYBIRDS.

(*LEIS CONFORMIS*.)

Mr. G. Buchanan, Inspector under the Insect Pests Act, reports to the Secretary of the Department of Agriculture as follows:—"On the 28th May I went to Gingin and distributed a quantity of the ladybirds (*Leis Conformis*) recently received from Mr. Lea, Government Entomologist of Tasmania, among the orangeries in which aphides and scales are to be found. I visited the orchards of Messrs. Wedge & Harper, H. Brockman, R. Edwards, J. V. Jones, J. Meakins, J. Mortimer, W. R. Philbey, R. Collett, and A. E. Nadehaum, and liberated a number of the *Leis Conformis* at each place. These gentlemen have kindly promised to report any developements of interest that may arise from the introduction of this parasite among the pests present on their trees. I am pleased to be able to state that the orchards are much less severely infested with the red and black scale than on my last visit of inspection. The orange crop is very light in this locality this season, but the quality of the fruit is extremely fine in point of size, and the fruit is much cleaner and brighter in appearance than during recent seasons."

CODLIN MOTH IN SOUTH AUSTRALIA.

In the *Adelaide Advertiser* on May 22 a paragraph from its London correspondent appeared, in which it was stated:—"I have discovered in some of your apples unmistakable evidence of the presence in some of your orchards of that terror of apple-growers, the codlin moth. Unfortunately, though I have tried, I cannot trace the origin of the fruit which has come under my notice. The cases in which the fruit were bought at Covent Garden have been sold for firewood, and the only information the buyer could give was that they were branded 'South Australian Dépôt.' The apples were Dunn's seedlings. Your experts should at once make strictest investigation, and prompt measures should be taken by the Government and growers in concert to stamp out the plague." Commenting upon this statement, the *Advertiser* says:—"Mr. G. Quinn, the fruit expert, states that he has been unable to examine apples sent through the South Australian Dépôt during the past two seasons owing to pressure of business, and to his being in the country on a number of occasions when shipments have been made for London. He, however, recognises that great injury to the export trade in fruit from this State to England is likely to be done if codlin moth infested apples are sent there. If buyers in London purchased affected fruit they would naturally have little or nothing to do with consignments from Adelaide, and Mr. Quinn intends, if possible, to have consignments through the South Australian Dépôt inspected in future as they were previous to two seasons ago. He states that most of the fruit has been exported by private firms for some time past, and not through the dépôt. He has pointed out to the firms interested in the industry that it is absolutely necessary in their own interest that sound consignments should be forwarded, and they, he thinks, appear to fully realise this. Although there are regulations which permit a Government officer examining the shipments of fruit of private firms, such inspection is not carried out. When asked if any difficulty was experienced in detecting the presence of the larvæ of the moth in apples, Mr. Quinn replied that it was easily noticeable in the majority of kinds. In the case of the Cleopatra, however, it was different. From the calyx to the seeds there was a natural narrow passage, and by enlarging this very little the young larvæ could get to the centre of the apple and start its work of destruction. An expert could, however, soon tell that something was wrong by the premature ripening of the fruit. Last season, Mr. Quinn says, tremendous damage was done by the moth, the season being exceptionally favourable to its propagation."

An American chemist is said to have discovered a method of fixing the nitrogen which is always present in the air. If this is correct, and the process can be worked at a reasonable cost, it will furnish a supply of the most valuable kind of fertilizing material known.

THE INSECTIVOROUS BIRDS OF WESTERN AUSTRALIA.

By ROBERT HALL.

THICKHEADS.

Among the shy and gentle birds may be placed the *Pachycephalæ* or Thickheads. Not recluse as the "Coach-whip" nor silent as the Heron, but retiring in disposition we find these birds. They occupy river sides, and live among the tea-tree thickets. Though elegant in form, beautiful in color and rich in voice, it is quite surprising how little we know of the family, especially as the whole series of thirteen species is confined to the Australian region. When one considers that not even the main facts in the life history of a single species were known up to last year, it is about as unfortunate as the prophet who has no honor in his own country. However, the peculiar phases of a typical species are now known to us. It is not usual for the authorities of the British Museum in recording species to add the word "Insectivorous." This they did to their voluminous catalogue, and the meed of praise is of more than ordinary moment to us. I believe when I say that throughout the Continent the whole genus is perfectly harmless and remarkably useful in the interest of the growers, I am within the bounds of propriety.

Six species are to be found in Western Australia. The southern common one being *P. occidentalis*, the northern common bird *P. falcata*, and the central species, *P. gilberti*, a bird fond of dry parts.

WESTERN THICKHEAD.

Pachycephala occidentalis, Ramsay. (*Pak-i-sef' a-la ok' si-den-ta' lis*.)

Pachys, thick; *kephale*, head; *occidentalis*, pertaining to the west.

Pachycephala occidentalis. Preserved specimens, Victorian Museum, Perth.

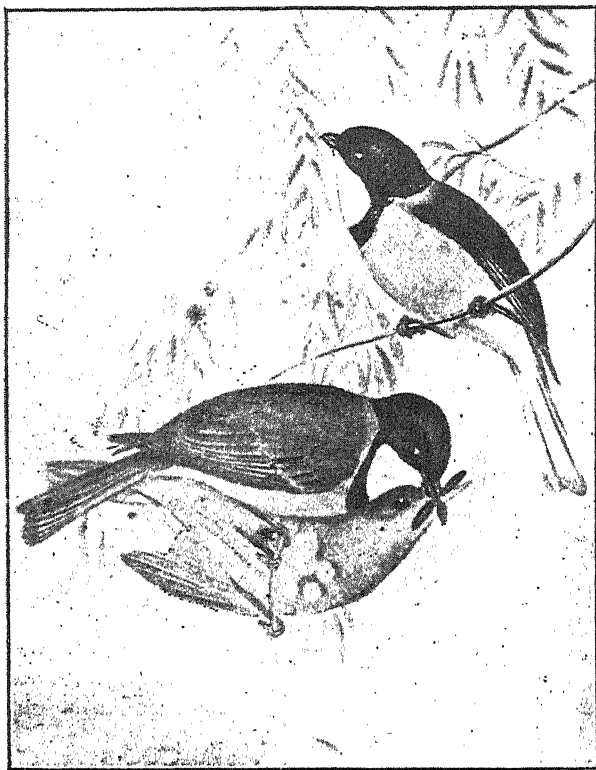
"Key to the Birds of Australia," Hall, p. 33, (1899).

GEOGRAPHICAL DISTRIBUTION.—Area 9.

KEY TO THE SPECIES.—Male: Under surface rich yellow; pectoral collar jet black; throat white; head black; only terminal part of tail black, basal part grey. Female: Throat pale brown, with white spots; under parts buff, without streaks; under wing coverts whitish; general colour above, head, neck, upper tail coverts, and tail, olive-brown; wing coverts and secondaries blackish-brown, edged with reddish-brown; primaries edged with grey; bill stout and black. Young: Uniform grey. Fledgling: Rusty colour, lighter brown on wings.

The male is conspicuous by its yellow under-surface, the female being modestly attired in grey. One meets it seldom away from watercourses, where its presence is made known by a sweet and strong crack-like note. Whether our species practically embraces the South-western and the South-eastern species is a matter of doubt with the present writer. In any case the life history in the principal parts agree with the bird found in Victoria (*P. gutturalis*).

In speaking of this latter bird, the celebrated naturalist, Mr. John Gould, says :—"The *Pachycephala gutturalis* may be regarded as the type of this genus, the members of which are peculiar to Australia and the adjacent islands to the northward. Their habits differ from those of most other insectivorous birds, particularly in



WESTERN THICKHEAD (Two adults with young).

their quiet mode of hopping about and traversing the branches of trees in search of insects and their larvæ. Caterpillars constitute a great portion of their food."

As no exact attention has yet been given to the nesting habits of any species of this genus prior to those by the writer in the *Victorian Naturalist*, I reproduce a portion. *P. gutturalis* is practically *P. occidentalis*, if not quite the same.

"NESTING HABITS.

Observation I.—September-October, 1899.

25th September. First egg laid in nest.

26th September. Second egg laid in nest.

- 12th October. Young hatch out, having a little reddish down on body.
- 16th October. Grey quills rise from wings, tail, and along ridge of back.
- 20th October. Rufous feathers growing rapidly on wings and back.
- 21st October. Eyes of young open; feathers forming on breast and neck.
- 23rd October. Young leave nest; feathers formed on crown.

Observation II.—October–November, 1899.

- 15th October. Building of nest commenced, the female alone doing the work from start to finish.
- 28th October. Nest completed and first egg deposited in it.
- 29th October. Second egg laid.
- 14th November. Young birds hatch out of shells.
- 23rd November. Eyes open.
- 29th November. Young birds are separated, each parent taking charge of one and exclusively feeding it. The wings have assumed a darker colour.

The male alone feeds its charge, the female doing the same with the other young bird. The young come to receive food at the calls of the guardians, each obeying the call of its particular one. No cross purposes seem to be entertained as regards food.

A young bird from a nest, when caged, for 12 days following freely caught flies upon the bars of the cage, largely living upon them in preference to still food supplied."

A phase of this first plumage is the throat of the rusty brown bird becoming greyish white (February), while, from what I have seen in the field, another phase when handled shows the throat to be rusty-brown—the second last place (wings last) to remain rusty-brown in the complete change from phase 1 to 2. An example of the February phase of bird above was held under observation by my friend, Mr. George Graham, until 25th July, losing sight of it between the 18th and 25th July. This inclines me to believe that the rusty-brown, or first plumage, is retained for more than six months, and that it gives way to the grey, or second phase, in time for the first breeding season—a season of immature and very modest plumage. The want of competition, surely, is the male bird's champion! Phase 3, of a male that must be at least two years of age, is an elegant one. Also I met one in December, about 1894, that was quite an exception to "bright plumage indicating weak powers of song," for it had so wonderful a voice, that when I heard the ringing music I felt entranced. Although years have passed, so delightful was it, the song still seems to ring with the full enjoyment of that time. I met during the same week with a second specimen of this bird with a phenomenal voice, but only on those two occasions have I heard the strong, sweet, clear and regular series of running notes.

Nest.—Neatly but loosely made saucer-shaped structure of dry grasses and rootlets, with lining of finer material; placed in forks of a scrub, and a few feet only from the ground.

Eggs.—Three eggs to a sitting; ground color, varies considerably from a creamy-white to the ordinary brownish-buff, over which are dark-brown with paler lilac spots, as if beneath the surface; a zone is formed at the broader end. Length 0.95 inch; breadth, 0.65 inch.

RUFIOUS-BREASTED THICKHEAD.

Pachycephala rufiventris, Lath. (*Pak-i-sef' a-la ruf-i-ven'tris*).

Pachys, thick; *kephale*, head; *rufus*, red; *venter*, abdomen.

Pachycephala pectoralis, Gould, "Birds of Australia," fol. vol. ii., pl. 67. "Key to the Birds of Australia," Hall, p. 34 (1899).

GEOGRAPHICAL DISTRIBUTION.—Areas 9, 7, 6, 4, 3, 2.

KEY TO THE SPECIES.—Male: Throat white; under surface orange-brown; ashy-grey above; bill at nostrils equal in height and breadth. Female: Throat and cheeks white, with dark-brown streaks; under parts light-fawn, distinctly streaked on breast; lores and ear-coverts ashy-brown.

The male bird is rendered elegant by its rufous under-surface and clear white throat. The female is less showy, and has a striped under-surface. There is very little difference between them and *P. falcata*, of the extreme north, and the ear coverts alone decide it. In the naming of this bird brain power was not considered, as the noticeable breadth of the cranium provided the original idea. In habits it is very much the same as the previous species, though it spends much of its time away from creeks, and breeds, as a rule, in the saplings of dry places. In this respect it differs from *P. gutturalis*. The note of the bird is terminated by a smack, as if made with a whip. In this particular it is similar but much inferior to the "Whip-bird" (*Psophodes*). Although a winter resident in the south it is nomadic, passing from place to place with its young, which do not mature for at least two years.

Nest.—Practically the same as that of the preceding species.

Eggs.—Basal color, olive like; a zone of spots of a similar shade, stronger round the broad end. Three to a sitting. Length 1 inch; breadth 0.8 inch.

GILBERT THICKHEAD (Red-throated Thickhead.)

Pachycephala gilberti, Gld. (*Pak-i-sef'a-la gil-bert'i*.)

Pachys, thick; *kephale*, head; *Gilbert*, a proper name.

Pachycephala gilbertii, Gould, "Birds of Australia," fol. vol. ii., pl. 71. "Key to the Birds of Australia," p. 34 (1899).

GEOGRAPHICAL DISTRIBUTION.—Areas 9, 7, 6.

KEY TO THE SPECIES.—Male: Throat rusty red; black pectoral collar; head and upper surface ashy grey; under surface sandy buff; chest washed with brownish grey; lores black; under wing coverts sandy buff in both sexes. Female: Upper surface like male but wants the black lores and rusty red on throat, the throat and fore neck being grey, gradually passing into buff on rest of under surface.

The male alone has the rufous colored throat. The species has rather an isolated life living in the dry wooded areas. Most Thickheads prefer plenty of water. From near Kalgoorlie specimens of the young have been sent to me for identification which shewed the nesting to be as early as July.

Nest.—Similar to the preceding species; built about four to six feet from the ground as is usual with the other members of the genus.

Eggs.—Two, or three to a sitting; similar to those of the preceding species but lighter in olive, which is slightly greyish. Length 1 inch, breadth 0·8 inch.

Of the remaining three species, one only is common, they are:—*Pachycephala falcata*, Gld. Northern Thickhead; *P. lanioides*, Gld. White bellied Thickhead. *P. simplex*, Gld. Brown Thickhead. The first is plentiful along the Fitzroy River and is the northern representative of *P. rufiventris* in the south. The three are found only in northern Australia.

The female of *P. lanioides* was unknown to us as late as May of this year. The author then described it before the Field Naturalist's Club of Victoria.

Cuckoos.

This family forms in our island continent a strange and useful series of birds. If there is one cause of attraction to the Cuckoo it is because of the parasitic habit all but one species have. With this exception no one builds its own nest, and I should say in ninety-nine cases in every hundred the young cuckoo of each turns out the whole brood of rightful young. Tom-tits, robins and flycatchers are largely "imposed" upon, for when a tit builds its nest a wandering cuckoo will then lay one egg in it. Altogether four or five young birds hatch out in the nest, but before any one has opened its eyes, the featherless cuckoo has instinctively thrown them out into the cold air. Although it may not be a case of "nature red in tooth and claw," it seems but one remove from it. The tiny cuckoo edges its way under a little bird, hoists it up to the ledge, and then drops it on the other side; such an effort being made a dozen or more times before it is successful. Each in its turn goes the same way and the stranger alone is left to be fed and fondled. That it is a provision of nature is almost self-evident, because a cuckoo is like a young cormorant in respect to the prodigious appetite, but differing in so far as it has not fifty worms inside the stomach to help eat the food as it is being digested.

As the young cuckoo grows it must leave the nest and perch upon it. It gets too large. The tits all this time work laboriously to feed one bird, spending more time, I believe, than they would need to have done had they their own little family to support. Their good nature makes them "genuine hearted" foster parents.

Excluding the winter season, the *Cuculidæ* are always to be found in our southern parts, and even then solitary birds remain

instead of getting north, as is their migratory habit. Listen for them in August or in the early part of September, and you will generally hear the voices of three species apart from the calls of all other birds in this State. Of the twelve Australian species of cuckoos, nine are to be found in our State. Altogether some 180 species are known, and represented by (a) True Cuckoos (*Cuculidæ*); (b) Lark-heeled Cuckoos (*Centropodinaæ*); (c) Bush Cuckoos (*Phænicophæinaæ*); (a) is universal; (b) is tropical—for example, the Spur-footed cuckoo of Queensland; (c) is unrepresented in the Australian region.

The largest of our mainland cuckoos (*Centropus phasianus*, Lath.), measures 24 inches in length, and is the only non-parasitic species, while the smallest (Bronze Cuckoo) is 5½ inches, and, like all the others, is parasitic.

When cuckoos, or cuckows, as Professor Newton has it, arrive here to spend the warm season, they do not come with the voice that tells the European people their blithe spring comers have arrived. Even the boys are puzzled with them and their eggs, and in addition, seldom answer well why the anomalous eggs are found in certain nests. They have the "wandering voices," but not the notes from which the simile is drawn.

PALLID CUCKOO.

Cuculus pallidus, Lath. (*Ku' kulus pal' id-us*).

Cuculus, a cuckoo; *pallidus*, pale.

Cuculus inornatus, Gould, "Birds of Australia," fol., vol. iv., pl. 85. "Key to the Birds of Australia," Hall, p. 58, (1899).

GEOGRAPHICAL DISTRIBUTION.—The whole of Australia and Tasmania.

KEY TO THE SPECIES.—General appearance grey; eyelash yellow; tail barred with white, and fan-shaped; wing reaching beyond tail coverts; feet zygodactyl.

When the spring blossoms begin to appear in the fields, the minstrelsy of the cuckoos is heard along the borders of towns as well as forests. After this the piercing voice is more rural, and till late in January, on rare occasions, the call for what I consider a marriage partner, is still given, and repeated until Dame Fortune beams on him. Especially in October are the weird notes of another, the Bronze species, heard above those of smaller denizens of the same woods. As for the Pallid Cuckoo, it sits upon the tallest dead bough of the highest tree and wails its melancholy note until those of each bar in the ascent become thoroughly *accelerando*.

Everyone living beyond a city should hear the bird in its first burst of "song" in August or September, but it is apparently dead to the world of men by February. The little birds begin to lead a lively life on arrival of these nomads, for, being parasitic, objections are raised. In the case of the Pallid species, nests of birds building open structures are chosen, while most of the other species are distributors of their honours to those of side entrances,

as well as wide open cups. The fan-tailed species and two bronze species choose 75 per cent. of dome-shaped nests, while the square-tailed species is content with 50 per cent., and the remaining half of open nests. Because tits are so thoroughly insectivorous and obliging, they act in the majority of cases as foster-parents.



PALLID CUCKOO.

The mature cuckoo is supposed to be the only bird that eats hairy caterpillars, and probably the only insectivorous one that is supposed to lay twenty eggs in a season, so that there should be plenty of cuckoos to combat the larvæ. If I mistake not, we will find that one of the birds already introduced to our State eats hairy caterpillars.

Cuckoos start to call at daybreak, and the Bronze disturbs the peace in the hours just previous to midnight. I have more than once left a cosy fire at 10 p.m. to investigate the strange sound.

Nest.—This species being parasitic it has no nest of its own,

but places the egg in one or other open nest of an insectivorous bird, such as the robin or fantail.

Egg.—One in a nest ; pale salmon colour, generally uniform, but sometimes with odd spots of chestnut upon it. Length, 1 in.; breadth, 0.75 in.

ASH-COLORED CUCKOO (Fantailed Cuckoo).

Cacomantis flabelliformis, Lath. (*Kak-ō-man'tis fla-bel-i-form'is*.)

Kakos, bad, ill; *mantis*, a prophet; *flabella*, a fan; *forma*, a shape.

Cuculus cineraceus, Gould, "Birds of Australia," fol. vol. iv., pl. 86. "Key to the Birds of Australia." Hall, p. 58 (1899.)

GEOGRAPHICAL DISTRIBUTION.—Areas 9 to 1, inclusive.

KEY TO THE SPECIES.—Grey above; breast ferruginous; outer webs of tail feathers touched with white; under surface of wing with single oblique white bar; wings not reaching to end of tail coverts; tail fan-shaped; feet with two toes facing forward and two rearward.

The call of the Ash-colored Cuckoo is a high-pitched, hard-sounding trill, and given as if the bird was in trouble and seeking someone. It gives me the impression that the meaning of its generic name, "prophet of ill," was applied as if it had a direct bearing on the voice. It is certain the birds of the neighbourhood do not like it, and as my friend (Mr. Graham) has made a fuller observation, I quote from one of his letters to me, as follows:—"On the 30th August, 1897 (eighteen days after the arrival of the Cuckoo), a pair of Scarlet-breasted Robins attacked an Ash-colored Cuckoo, alighting together upon its head and back. They worried it for half a minute, the Cuckoo not caring much, judging by appearances. When it flew away to catch a grub, several Yellow-rumped Tits took offence at its presence and offered fight. Flying to a green tree, it was then beset by a White-shafted Fantail. From there it flew to the ground, amongst the ferns (*Pteris*) outside the slab fence. I could not see it, but by the loud commotion among the Scrub-Wrens (*Sericornis*), it evidently was not welcome. Having risen again, it was attacked by the Sordid Wood Swallow in force, and driven off. During the series of attacks it offered no defence, seemingly occupied alone in the search for its daily food."

A second species, and one very closely related is *C. Variolosus*, *Hors.* (Square-tailed Cuckoo). The upper parts are darker and browner than *C. flabelliformis*, and there are no white markings on the outer webs of the tail feathers. Total length 8.5 inches; wing 4.3 inches.

Nest.—A freshly built one of some other insectivorous bird, either open or side entranced.

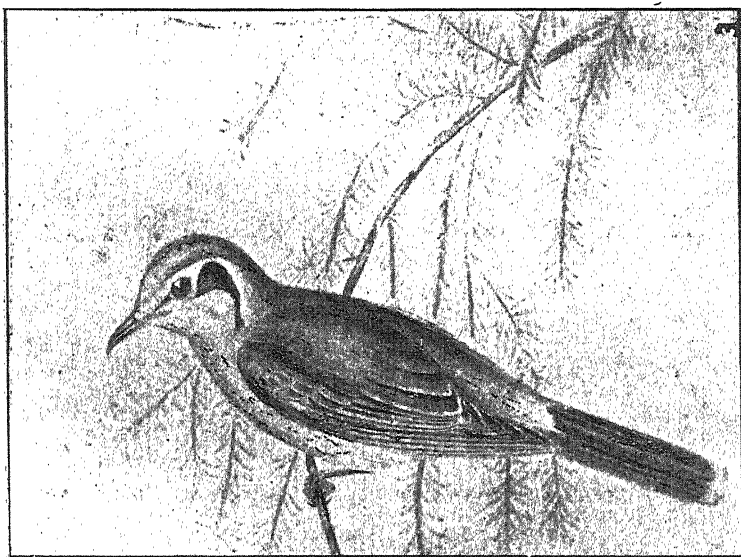
Eggs.—One to each nest. How many for the total in a season is unknown. Oval as a rule, fleshy white, and marked more or less over the whole surface with minute pinky spots. Length 0.9 inch; breadth 0.6 in.

BLACK-EARED CUCKOO.

Misocalinus Palliolatus, Lath. (*Mis-ocal'i-us pal-i-o-la'tus*.)*Misos*, hatred; *halios*, nest; *pallidus*, pale; *latus*, side.*Chalcites osculans*, Gould "Birds of Australia," fol. vol. iv., pl. 88. "Key to the Birds of Australia." Hall, p. 59 (1899).

GEOGRAPHICAL DISTRIBUTION.—Areas 9, 8, 7, 6, 1.

KEY TO THE SPECIES.—Ashy-brown; quills dark brown: outermost upper tail coverts with broad marginal ends and some faint bars; all tail feathers with broad whitish ends, and five other distinct white bars on inner webs of outer pairs; on side of head a broad white eyebrow, and a black band through eye over ear coverts; under surface of body rufous-buff; white on abdomen, thighs, and under tail coverts. Total length 7·5 inches; bill 0·75 inches; wing 4·75 inches



BLACK-EARED CUCKOO.

Gilbert, who discovered this bird in Western Australia, says "that it is very shy, and that he met with it only in the interior of the country. It utters a feeble lengthened and plaintive note at long intervals. It flies slowly and heavily, and but a short distance at a time. The stomach is thin and capacious and slightly lined with hairs of caterpillars." Specimens are certainly rare in collection; those in that of the author are from Kalgoorlie and Derby.

Occasionally two cuckoo's eggs are laid in the same nest, and most likely by different birds. The unrest of those birds till the foster-parent's chicks have been ousted must be very great, and then among themselves it is a parallel case to when "Greek meets Greek," but we have no record as to what success attends the struggles.

One could scarcely conceive it possible that there would be "honor among thieves," but rather that the law of the survival of the fittest would govern circumstances.

Nest.—As with the preceding species, the generic name appears to imply a hatred of building a nest for itself, which it certainly leaves to other birds to do.

Eggs.—Long oval in shape; color nearly a uniform shade of reddish-chocolate. Length, 0.8 inch; breadth, 0.6 inch—(A. J. Campbell).



BRONZE CUCKOO. Adult and young.

BRONZE CUCKOO.

Chalcococcyx plagiatus, Lath. (*Kal-co-hok'siks plā-go'sus*.)

Chalkos, copper (i.e., of that colour); *hokkux*, a cuckoo; *plaga*, a stripe; *ous*, denoting "presence," fulness.

Chrysococcyx lucidus, Gould, "Birds of Australia," fol., vol. iv., pl. 89. "Key to the Birds of Australia," Hall, p. 59 (1899).

GEOGRAPHICAL DISTRIBUTION.—The whole of Australia and Tasmania.

KEY TO THE SPECIES.—General appearance bronzy; the under surface clearly barred, crown and back of neck dark violet-brown; basal half of tail never uniform rufous; no rufous edges to quills and with little rufous on under surface of wings and outer pair of tail feathers. Total length 6.25 inches; wing, 4 inches; tail, 3 inches.

Of the four species of "Bronze Cuckoos," three are Western birds, two of which are profitably common throughout the whole

State, while a third bird is found only about the Fitzroy River in the west of the Continent. The present bird is the most numerous of our cuckoos.

In the same district, and even in the same paddocks, we have two species of Bronze Cuckoos that are very much alike when on the wing. The one differing from the above is known as the Rufous-tailed or Narrow-billed Bronze Cuckoo, because it has a narrower bill and the basal two-thirds of the tail are rufous. One lays a bronze egg, the other a pink-spotted one. Sentiment, as with most birds, is in this one. Early in September recently, when they arrived in the course of migration from the north of Australia, I saw three upon the same bough. One flew to the ground, and the remaining two became very frivolous. One of the bough birds now sought an insect in the air, and catching it returned and offered it to number three, who very sensibly accepted it. The ground bird must have been offended, for it did not return to the bough, and the group dispersed.

"Diamond cut diamond" is manifest often enough with the Narrow-billed Bronze Cuckoo (*Chalcocoryx basalis*, hors) and the Blue Wren, but now I find the Striped Ground-Tit, an Eastern Australian bird, objects also. I observed a cuckoo's egg in this tit's nest under the inner lining. The Ground-Tit had covered it to stay incubation. In December I took from the male chamber of a Yellow-tailed Tit's nest a fresh egg of the cuckoo, while below in the incubating chamber were three young of the tit. The upper room was also domed, with side entrance, and I fear the cuckoo was as much deceived with this parlor as the proverbial fly was with another. A third peculiar case showed a cuckoo's egg upon the ledge of the nest of the White-fronted Chat (*Epthianura albifrons*), 18th December, 1895, while within were two quite naked young and one egg. Did the chat push this egg on to the ledge? I identified for a friend two eggs of this species in the same nest of a Titmouse (*Xerophila leucopsis*) along with five eggs of the latter (27th October, 1897).

Dr. Rey, in *Nature*, remarks that such an example is a sign of the colonising instinct, and upon his theory, these eggs being differently marked and with various color density, they belong to different females. The theory is said to have been exploded. Different members of this species have been known to lay their eggs in the nests of 22 different species of birds, and at the present moment there is the interesting point to be settled whether the insect-eating Diamond-bird (*Pardalotus assimilis*) is not also a foster-parent. It is not usual to place an egg 12 inches down a tree hollow, for how would the young cuckoo turn out the proper young of the nest? This interesting item will need time and observation to settle. The cuckoo's egg has been found in a similar situation, viz., in the nest of the tree-creeper. Recently, in England, photographs have been made of a young cuckoo in the act, as previously mentioned, of expelling the other young by placing its shoulders under each and lifting them overboard one at a time.

The foster-parents are all insectivorous birds with one exception (Red-browed Finch), and even that feeds its young on soft insects during the season. Robins, wrens, chats, tree-runners, and tits (chiefly the latter) pilot the egg and young through their early stages.

The presence of bars or stripes on the under surface seems to denote the meaning of *plagiosus*.

Nest.—Parasitic birds use other bird's nests. This species places one egg in the nest of a tit principally.

Egg.—One to a nest, occasionally two will lay one each for the same nest, uniform bronze colour. Length 0.65 in.; breadth 0.5 in.

Our cuckoos that are not strong numerically are:—

Eudynamis cyanocephala, Lath. Koel.

Scythrops nova hollandia, Lath. Channel-bill.

Centropus phasianus, Lath. Spur-footed Cuckoo.

They have characteristics that single them out from groups as strange birds. The last one has feathers with strong shafts that probably serve it specially in its grass-loving life. The Channel-bill has a strong bill, and the bird is 24 inches in length.

The Koel is a glossy black bird in the adult stage and is 16 inches in length.

CUCKOO-SHRIKES AND CATERPILLAR-EATERS.

The application of the common names given is a recent addition to bird-lists. The first does away with the old name (*Graucalus*) used in the vernacular, and supplies an applicable though strangely sounding one. It is rendered, I venture to think, because of its likeness on one side to the cuckoo in flight, and on the other to the Shrike in bill. The name of Caterpillar-eater cannot be said to be the sole right of this species, but it is far better than what everybody finds a struggle to remember, viz. *Campephaga* (i.e., eater of caterpillars).

Being numerous and highly insectivorous, they perform an important part in the economy of nature.

BLACK-FACED CUCKOO-SHRIKE (Blue Jay, Blue Pigeon).

Graucalus melanops, Gld. (*Gra'ka-lus mel'a-nops*, Gld.)

Graucalus, a perversion of *graculus*, a jackdaw; *melas*, black; *ops*, a face, *Graucalus melanops*, Gould, "Birds of Australia," fol. vol. ii., pl. 55, "Key to the Birds of Australia," Hall, p. 12 (1899).

GEOGRAPHICAL DISTRIBUTION.—Australia, except Tasmania.

KEY TO THE SPECIES.—Adult: Upper surface, bluish-grey; throat, sides of face, feathers round eye, and forehead, black; fore neck and breast, grey, shading into white on abdomen and under tail coverts. Bill broad, measured at gape equals outer toe without claw; culmen 1 inch. Total length about 12 inches. Young: Throat and forehead grey.

The graceful wave-like flight of this species will always attract one's eyes when the bird is upon the wing, or, if at rest, the composed posture and quiet chatter of one or more of the family

are sure to interest us. Upon return to the south in September from their migratory tour the flock plays very much among the trees, passing from one to another in the gentlest of manner till the party breaks up for the purpose of nest-building and more serious thoughts. The birds then become sedately quiet, and one will remain upon a branch for hours while its sitting mate is upon the nest. In the heat of the day the *Gracula* always rests amongst the foliage. The notes of the bird are similar to those of



BLACK-FACED CUCKOO-SHRIKE (Two phases of plumage).

the Oriole, neither of which are describable, unless, as the late Mr. Gould has it, "a peculiar purring or jarring sound uttered several times in succession, and, as a whole, given at long intervals." The food of the bird is very varied—insects, their larvæ, ants, etc. From the stomach of one I extracted more than 100 ants similar to the "sugar" kind, popularly known as the stingless section; among them were two large specimens of the *Coccinellida*. In referring to this species, that celebrated naturalist, Mr. Gould, says: "When the young, which are generally two in number, leave the nest the feathers of the body are brown, margined with light grey. This coloring is soon exchanged for one of uniform grey, except on the lower parts of the abdomen and under tail coverts, which are white, and a mark of black which surrounds the

eye and spreads over the ears. The throat and forehead in this shape are lighter than the remainder of the plumage, which is somewhat singular, as in the next change that takes place those parts become of a jet black. This color, I believe, is never afterwards thrown off, but remains a characteristic of the adult shape of both sexes. The infinite changes of plumage which some of the Australian members of this genus undergo from youth to maturity render their investigation very perplexing. I have done my best to define them correctly; if I have committed some errors let us hope that a son of the great southern land may be imbued with a sufficient love for natural science to pay attention to the subject and place it in a truer light."

The present writer, upon specimens secured near Albany, considers there is still room for further observation on this genus, and trusts the hope of the great naturalist will yet be fulfilled.

Nest.—Small, flat, and closely fitted to the fork of a horizontal bough. It is made of grasses, and externally covered with cobwebs to make the nest resemble the grey surroundings. You need to see the bird fly away to discover it for the first time.

Eggs.—Three, sometimes two to a sitting; ground color dull olive, with chestnut-brown spots boldly appearing on the surface, and dull lilac-red spots as if beneath the surface. Length, 1.25 inches; breadth 0.9 inch.

GROUND CUCKOO-SHRIKE. (Ground Graucalus).

Pteropodocys phasianella, Gld. (*Ter-o-po-do'sez fa-si-a-nel'i-de.*)

Pteron, a wing *podokos*, swift footed; *phasianus*, a pheasant.

Pteropodocys phasianella, Gould, "Birds of Australia," fol., vol. ii., pl. 59.
"Key to the Birds of Australia," Hall, p. 11 (1899).

GEOGRAPHICAL DISTRIBUTION.—Areas, 9, 8, 7, 6, 3.

KEY TO THE SPECIES.—General appearance grey; head grey; rump and abdomen white, with irregular bars; breast barred; tail forked. Total length, 13 in.; wing, 7.5 in.

It is a shy ground-loving bird, and although well disposed, it is not so common as the other members of that family. I have not met this species further south than York, still the country south-east of it should be very suitable. Its range of distribution is to the extreme north of the State in one direction, and along the southern portion of the continent in the other, adjacent to heavy timber. Well grassed and lightly timbered plains is where I have generally met this form. It rarely congregates, and may be seen in numbers from two to eight. When disturbed it flies rapidly away to the larger trees.

Nest.—Open and flat, placed upon a horizontal fork of a eucalypt, banksia or other tree; made of grasses finely and densely covered with cobwebs.

Eggs.—Uniform olive-green, sometimes faintly marked about the broader end with a chestnut shade. Length 1.3 in.; breadth 1 in.

WHITE-SHOULDERED CATERPILLAR EATER (White-shouldered
Campephaga).

Lalage Tricolor, Swains, (*Lal'a-jē tri'-kul-or.*)

Lalage, prattle; *tres*, three; *color*, colour.

Campephaga numeralis, Gould, "Birds of Australia," fol. vol. ii., pl. 63. "Key to the Birds of Australia." Hall, p. 12 (1899).

GEOGRAPHICAL DISTRIBUTION.—Areas 9, 8, 7, 6, 3, 2, 1.

KEY TO THE SPECIES.—Male: Under surface, under wing coverts, under tail coverts, and ear coverts white; upper wing coverts pure white; upper surface black; tail feathers black, outermost two with white tips. Female: Brown above, white edges to rump and tail; cheeks and throat whitish; buff edges to wing coverts; under surface yellowish, with obscure cross markings; under tail coverts white; wing 5 inches in length; tail 4 inches.



WHITE-SHOULDERED CATERPILLAR EATER (Male and Female).

There is a general resemblance between the male of this species and the male of the Hooded Robin. The *Campephaga* is slimmer, longer in the body, and more energetic, though not so graceful in its habits. In his notes from Western Australia, Gilbert says:—"This bird is a migratory summer visitant to this part (Southern) of the country, where it arrives about the beginning of September, after which it is to be met with in considerable numbers among the

mountains of the interior, but is very rarely seen in the lowland districts. Its powers of flight are considerable, and when excited during the breeding season the males become very pugnacious, and not only attack each other in the most desperate manner, but also attack much larger birds that may approach the nest. Its usual flight is even, steady and graceful, and while flying from tree to tree it gives utterance to its sweet and agreeable song, which at times is so like the full, swelling, shaking note of the canary, that it might easily be mistaken for the song of that bird. It is a remarkably shy species, especially the females, which are so seldom seen that I was at first inclined to think they were much less numerous than the other sex. This I afterwards found was not the case. Their favorite haunts are thickly-wooded places, and the most secluded spots. I have observed them in numbers breeding near the beach at Geraldton."

Nest.—In all cases a very small and shallow structure—often a flimsy one—made of grasses, and partly covered with cobwebs, placed upon a horizontal bough, or, more rarely, in a fork.

Eggs.—Two or three to a sitting; light green, with chestnut-brown spots and blotches. Length 0.75 inch; breadth 0.6 inch.

ORCHARD INSPECTION.

GENERAL MONTHLY REPORT.

During the past month the Inspectors under the Insect Pests Act, have been vigorously prosecuting their examination of orchards in the localities where the San Jose scale has been known to exist. A total of 83 orchards has been examined, with the result that the scale was found in fifteen orchards, the number of trees affected being 242. In the majority of cases only a few trees have been found attacked, but in one orchard at Armadale 147 trees were found suffering from this disease. Twenty-six of the diseased have been ordered to be grubbed out and burnt, and the remainder to be freed from the scale by fumigating with hydrocyanic acid gas.

The Inspectors also revisited those orchards in which the scale had been discovered to see that orders issued by the Department had been carried out, and report that in most cases the instructions had been complied with. In one case, however, the Inspector found that no steps had been taken to give effect to the order, the Inspector, therefore, had the diseased trees (4) grubbed out and burnt. Proceedings under Section 17 of the Act were taken against five Chinese gardeners who had failed to carry out orders issued to them, viz.: to pick and destroy fruit infested with fruit fly. A verdict with fine and costs was obtained in each case.

Nearly all things come out of the earth, and the farmer is the man that is instrumental in bringing them forth. All honor to him.

PRUNING.

BY A. DESPEISSIS.

In previous issues* the principles of pruning, and also the methods of training and of pruning vines best adapted to West Australian circumstances have been dealt with. The pruning of fruit trees and shrubs more commonly cultivated will be considered in this chapter.

PRUNING THE APPLE AND THE PEAR.

The pruning of these two kinds of trees, which both belong to the genus *pyrus*, is very much alike, and will for that reason be considered under the same heading.

In shaping and training the trees the first four or five years of their growth, the detailed information which has been given with regard to the management of low standard trees should be closely followed.

Like other deciduous trees they can be pruned whenever the wood is mature enough, which is indicated by looking at the terminal buds and the yellow color of the leaves. Pruning should then be pushed forward rapidly, and the prunings removed before the ground gets sodden with rain water. Deciduous trees, unlike citrus trees, should not be touched in the active growing season, except with the thumb nail, cherries and apricots, as seen below, forming the exception to this general rule.

Some varieties of apples, such as the Irish peach, and also of pears, bear the best fruit at the extremities of their long, slender and decumbent shoots. In such cases the small side shoots, which measure a few inches in length, are not pinched back, as explained further on, but allowed to bear as they like best, and as many of them as possible are left on the tree, and the longer shoots are shortened. This method is pursued until the main growths of the tree become very short or almost cease to move at all, when a certain number of these fruit spurs is cut off, so as to induce new growth. The rapid formation of numerous fruit spurs will stunt a tree; when this is the case they should be cut out at pruning time, otherwise the trees will be short lived. On the other hand, with such varieties as Ben Davis and Baldwin apples, which have a more compact form and a better distribution of fruit, thinning the branches should be practised after the bearing stage is reached. A wise rule to follow consists in cutting out or back every year, to get a healthy growth of wood.

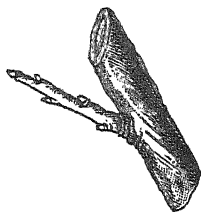
According to the habit of growth of the tree, it is pruned to an inner bud, if it is intended to close it in, as in the case of the Yellow Bell Flower, which would otherwise soon reach the ground like a weeping willow, to an outer one, if it grows too straight up

* Vide pp. 312 and 400 of Vol. 3 of the JOURNAL.

after the manner of the Northern Spy or the Bartlett pear, which grow like poplars. If it is intended to train a branch in a straight line, it is pruned to an outer bud one year and to an inner bud the next year.

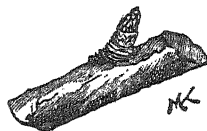
The branches of irregular-growing sorts, or of those exposed to the influence of high winds, will require to be secured for some time by stakes and soft tying material.

If we examine a young shoot of an apple or a pear tree of the previous season's growth in the winter when the tree is in a dormant stage, we find leaf buds all along its length. When the sap begins running, in the spring, the terminal buds produce wood shoots, the others on the middle of the twig called darts are either transformed into fruit buds straight away, or produce short side shoots which in subsequent years carry fruit buds. The buds at the base remain dormant unless excited into life by the suppression of those above them, so that by shortening a branch the sap, which naturally has a tendency to rush to the points, feeds these small dormant buds at the base, starts them



Small shoot in the middle of branch called "dart."

into growth, and forces them into what will eventually become fruit spurs. By following the mode of training and cutting back described above, we have therefore around limbs and branches, well distributed about the head, leaf buds which will continue the growth of the tree, and also fruit spurs and fruit buds evenly distributed all over the tree.



Young fruit spur near the lower end of branch or basal bud.

After the fifth year of training, and the sixth year in the case of some later varieties, and when the tree has settled down to the bearing stage, little hard pruning will be required. The new wood of the tree is trimmed back every year, and all dead wood, branches that cross and rub against another, and water shoots, are cut out.

The fruit spurs, however, require at that period some management, and will then continue bearing for many years more; unless these spurs are looked after we should have trees over-bearing one season and taking a rest for one season or two after. This is accounted for by the fact that if in young trees the fruit buds are several years in process of formation, they take in bearing trees two or three years, according to circumstances, and it becomes necessary, in order to renew and maintain their vigour, to systematically cut off the old part periodically and thus favour the formation of new buds at their base.

MANAGEMENT OF THE FRUIT BUDS AND BRANCHES.

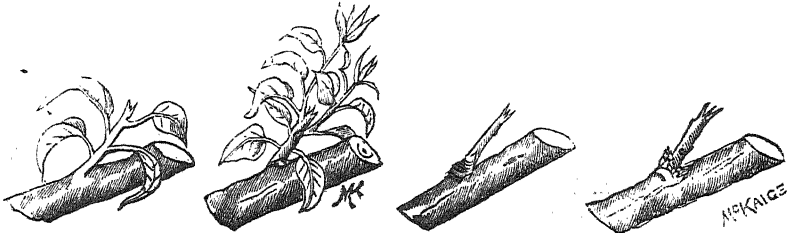
In pinching back side shoots intended to carry fruit buds, care



Shoot rightly pinched.

must be taken not to shorten them too severely, but allow them about four inches. If pinched too short, the little butt or shoot either ceases to grow and dies, leaving a vacant space on the branch, or else a year or two after this excessive pinching two small basal buds push forth on each side of the suppressed shoot; those will ultimately blossom, but at the loss of a season or two, or again premature shoots will grow, which will likewise be a longer

time setting to fruit, and are not likely to be so fruitful as better constituted shoots properly pinched would be.

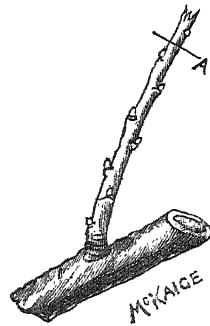


Shoots pinched too far back, and the result in different stages of growth.

We have seen already that the basal buds (see fig., p. 34) which grow slightly the second



Terminal shoot partially fractured.



Terminal shoot cut back 9 to 12 in.

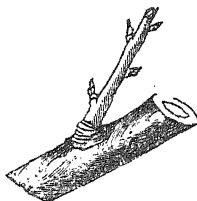
year of pruning eventually form young fruit spurs. The shoots, or darts, in the middle grow a

little more; they are not interfered with neither. The shoots, on the other hand, towards the end of the branch grow more vigorously, and are cut back at the time of pruning, or are partially fractured. They will after a few years also carry basal fruit buds and darts.

The third year after pinching back the young terminal shoot, the basal buds (see page 34) have only developed a rosette of flowers, having a bud in the centre, and have increased a little in length. They now have the appearance shown in the figure illustrating a matured fruit spur, the bud being plumper. They blossom the following spring, and are now matured fruit spurs (as seen below).



Matured fruit spur.



Two-year-old darts.

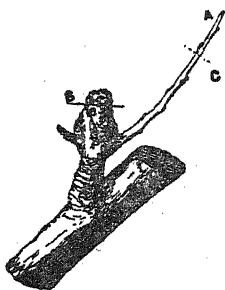


Fruit Spur after first fructification.

At that period the darts have also developed several fruit buds and probably also the shoots at the top end of the branch.

At the fourth season of pruning, the fruit spur has fructified, and has formed at its termination a spongy swelling called a *purse*, while it carries at its base smaller buds which become flower buds in the course of two years or so.

Should one of these buds grow into a vigorous shoot A, it is pinched back at C, the swollen purse being liable to decomposition, should be cut off at the top, as shown in the figure. The buds on the dart are now a little more advanced, and will soon burst out into blossom, which at the subsequent winter pruning, after fruiting, is treated like the basal buds carrying the purse, as shown above, and so are the buds on the terminal shoots.



Fruit spur with small branch pinched.

As illustrated and mentioned above, the fruit spurs, after bearing, often produce new flower buds at their base after two or three years, the fruit spur having ramified as shown in the figure; so also the fruit spurs on the darts, which, after eight years or so, will be

NOTE.—Most of the illustrations given in the chapters on pruning the apples, pears, apricots are from Du Breuil's "Culture of Fruit Trees."—A. D.

somewhat as represented in the accompanying figure, and after



Six years' ramified fruit spur.

Eight years' fruit spurs on a dart,

a few more years will represent the appearance shown in the woodcut.

It is now advisable, in order to have fine fruit, to cut some of these buds back, so as to insure to the fruit a sufficient supply of



Method of pruning an old fruit spur.—DU BREUIL.

sap, and this is done as shown above. The sap then forces into growth some more dormant buds at the base of the enlargement. If the fruit buds have already grown to large dimensions, they are gradually cut back, the first year to B, and the following at C, and the next at D. Should they be cut straight away at D, there will in all probability not be much fruit the next year, whilst the tree will be forced into fresh wood growth.

PRUNING THE QUINCE.

No fruit tree is more neglected than the quince, which is hardly ever pruned. Its natural habit of growth is that of a confused and scattered bush; by proper training, however, it can

be made more shapely and more productive. A stout and straight trunk should be secured by cutting off all the other stems and keeping it tied up to a stake to prevent it from straggling. This is cut back the second year at a height of 12 inches from the ground, and treated in the manner described when dealing with the training and shaping of young trees.

The bearing branches of the quince are small twigs produced on wood at least two years old; these produce besides short shoots, on the point of which the fruit is borne singly. At pruning these bearing branches are shortened back and produce new fruit spurs.

PRUNING STONE FRUITS.

What has been said about the early training of deciduous trees as low standard, applies to stone fruit as well as to pippin fruit. The subsequent management of the fruit spurs of stone fruits differ, however, in several points from that of pippin fruits. In the former, the fruit spurs require about three years for their growth, but when formed they last, with proper attention, for a long period. In stone fruit the fruit spurs are of much quicker formation, and in the peach and nectarine notably, they blossom the spring following their first appearance on the previous season's growth.

PRUNING THE PEACH AND THE NECTARINE.

The peach and the nectarine, like the apricot and the plum, are profuse bearers, often inclined to over-bear, and are in consequence not very long-lived, especially the first two, whose period of useful existence extends to about 15 years, unless their strength and exuberant vitality are checked and controlled by judicious pruning and thinning out of the superabundant fruit crop.

At the time of planting, if a yearling tree, cut them back to a straight stem about 18 inches high, and prune to side branches, on which are left one single bud.

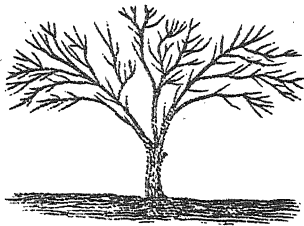
From their habit of growth, the peach and nectarine require constant and yearly prunings, the method adopted in these instances being that of *shortening in*.

A standard stone-fruit tree is trained in precisely the same manner as described above, with a low head, which affords shade to the roots and the trunk and limbs, and facilitates pruning, spraying, gathering, etc.

A clear understanding of the constitution of the bearing shoots of these trees will throw light on the best method of pruning them.

On account of the larger size of the circulating channels in these trees, the sap tends to rush towards the extremities of the shoots much quicker than in other trees, and the buds that do not push and form shoots the first season are—unless the branch which carries them is cut back—lost, as, unlike most other fruit trees, they are not excited into growth by cutting back in subsequent seasons. This explains how it is that trees that have been neglected or wrongly

pruned in their youth, present long limbs denuded of young wood and bark, and look like skeleton trees, which soon perish after over-bearing themselves.



A peach tree without pruning, as commonly seen.—DOWNING.

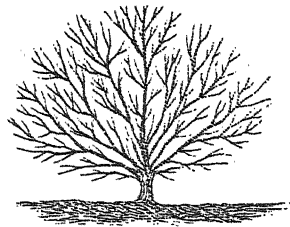
In the peach, nectarine, and apricot the fruit branches are productions of one season's growth, the fruit buds forming one season and blossoming the next. In the first two more especially, the fruit is borne on wood of the previous season's growth, and any limb, or part of a limb, destitute of such wood is sterile, so that the great object of the grower is to so prune the tree by cutting hard back

that it is always covered with a regular and constant succession of annual bearing shoots.

As in the case of all stone-fruit trees, wood that has borne fruit will bear no more.

The young shoot (one or two feet long) of the peach and the nectarine is furnished with a certain amount of wood buds and of fruit buds. There are one or more wood buds at the terminal points, fruit buds in the middle, and two or three wood buds at the base. Unless the branch is shortened in, the fruit buds blossom and produce fruit, and the following season the terminal shoots grow thin and weak, as the fruit below have absorbed most of the sap, while the wood buds at the base fail to grow, leaving a barren, useless stick.

By proper pruning, however, or shortening in, one-half or so of last year's growth, outside as well as in the interior or lower parts of the tree, the crop is reduced by one-half, and still it will be too abundant for the tree to carry and bring to full size and perfection, unless thinned out; the flow of sap is fully utilized by what is left of the young wood; the leaf buds at the base produce vigorous young shoots, which will keep the tree well supplied with bearing wood for the next season; the foliage will be more luxuriant, the fruit larger and more luscious. At the same time that the shoots are shortened in, those that have already borne fruit are cut out.



A peach tree pruned by the shortening-in mode.—DOWNING.

This method of pruning being carried out year after year, the small wounds heal readily. Large limbs have not to be cut back so often, thereby endangering the life of the plant, owing to the part drying up or decaying, and the sap poisoning the other parts of the tree and favoring the gumming, one of the worst diseases of stone-fruit trees.

After seven or eight years the growth of the main branches will become very short, and the pruning will consist mainly of the cutting out the twigs that bore fruit the previous year; (2) thinning out the twigs that will bear the following year, taking out more than half of them; (3) cutting back one-half the length of the remainder. The latter will depend on the location of the fruit buds. In shy bearing varieties, where the fruit buds are towards the extremity of the twigs, the cutting back is omitted. In the case of heavy bearers, like Early Crawford, Foster, Elberta, that have plenty of fruit buds all along the twigs, there will still be plenty left after cutting back. Do likewise with the Nectarine and the Almond.

Very vigorous trees are sometimes shy bearers, and can be induced to bear by continued summer pruning, and occasionally an autumn root pruning. In a good season, when fruit sets well, thinning out when about the size of a marble, and before the kernel has hardened, will prevent breakages owing to overloading, and also spare the tree and enable the rest of the fruit to develop to larger size.

PRUNING THE ALMOND.

The first few years the young tree is trained on the principles laid down when dealing with the formation of low standard or "vase" shaped trees. Some varieties have a weeping willow habit of growth, and all branches pointing downwards should be cut to insure the symmetry of the tree. After the third or fourth year the pruning will simply consist in cutting dead wood, cross and broken branches, and the shoots pointing downwards, which might interfere with horse cultivation.

The almond carries its fruit on laterals growing on new as well as on old branches, and, unlike those of the peach, the laterals of the almond do not die back annually, but remain productive for several seasons, they should not therefore be cut back as in the case of the twigs of the peach that have just borne fruit.

PRUNING THE PLUMS AND PRUNES.

Low training is to be recommended for the plums and prunes, and cutting back severely, during the first three years, the long shoots so as to shape the tree, form a stocky and erect growth, and favour the formation of fruit spurs along the main branches, where the bulk of the crop should be carried, thus preventing the excessive bending down of the branches under the weight of the fruit. The centre branches are well thinned out, thus leaving the interior more open to the general influence of sun, light, and air, and stimulating a consequent development of fruit buds in the inside of the tree, instead of leaving exterior branches to bear all the burden.

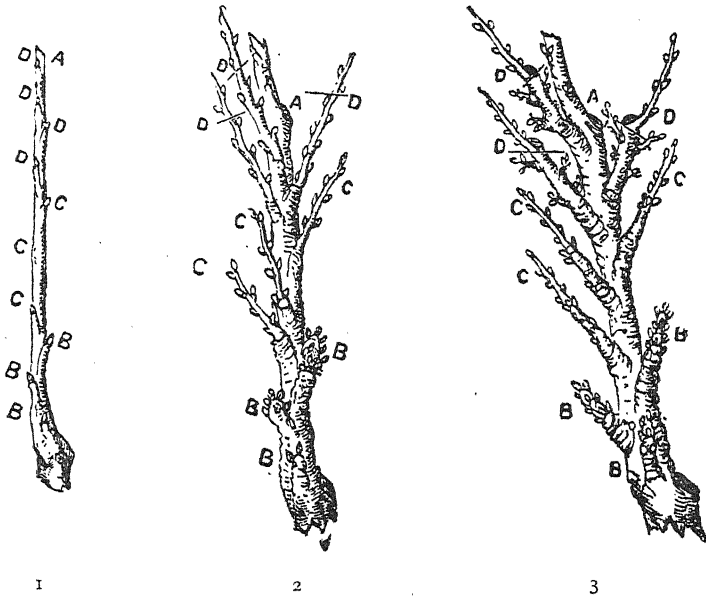
Should the tree show an inclination to run to wood and be tardy in putting forth fruit spurs, summer pinching, by checking its

growth, will hasten the time of productiveness. When in full bearing the trees require very little pruning, beyond the removal of rank shoots, which are misplaced dead wood, and are obviously unnecessary.

The plums produce their fruit on small natural spurs situated at the ends and along the sides of the bearing shoots, one year up to four or five years old, but mostly on two-year-old wood. These spurs will continue in bearing for several years.

For the guidance of growers and pruners, it may be stated that the longer the wood of any variety takes to come into bearing the longer these spurs will remain fruitful.

A young plum shoot presents nothing but wood buds. That



1. First year's pruning for forming fruit bud spurs. 2. Second year's pruning of fruit spurs.
3. Third year's pruning of fruit branches.

branch cut at A develops at the subsequent growth more or less vigorous shoots, according as they are nearer to the extremity. Thus the buds at B will develop but slightly, those at C, growing about the middle, will grow two or three inches in length, while those shoots at D will probably reach a couple of feet. These last, with the exception of the terminal shoot, are cut back at the time of pruning to a length of four to six inches. The terminal shoot will thus extend and fruit buds will develop over the shoots left.

A year or so after the short spurs at B give birth to a few flower buds, they have in the centre a wood bud which will slightly extend their length. These spurs must not be cut. The larger ones at C have flower buds in the middle, and wood buds at the top

and must be cut back slightly, while those at D which are more vigorous, are shortened either by cutting or by partial fracture (see fig., p. 41).

After another year and in subsequent seasons, the lengthened spurs must be cut back a little so as to diminish the number of the blossoms and prevent the too great lengthening of the shoots. The same is done year after year, and when the fruiting shoots cease to bear they are cut back slightly in order to develop new replacing branches towards the base.

Some growers only shorten plums and prunes once in every two or three years, after coming into bearing. This practice holds as well with pears, but will not do with peaches, apricots, and Japanese plums, which require similar pruning to peaches.

PRUNING THE APRICOT.

The fruiting habit of the apricot is much like that of the plum, and the same method of shortening-in is adopted in this instance.

It moreover, like the plum, bears fruit spurs on older wood; these bear for several years, and being provided with leaf buds at the base, can be renewed by cutting back when they grow feeble.

The apricot is a spreading and rank grower, which, unless kept well within bounds, runs long branches, which are liable to split asunder in windy weather, when laden with fruit. For that reason no two shoots should come from one bud, or be directly opposite.



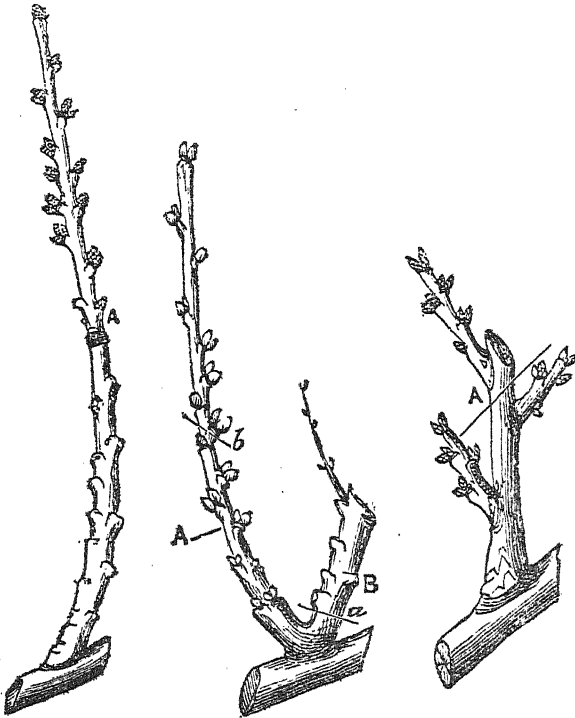
Apricot branch before pruning.

Pruning to inner buds is greatly to be recommended when shaping the tree, while summer pruning is frequently resorted to just after the crop has been gathered, so as to promote the formation of fruit buds at the base of the twigs, and minimise the risk of gumming, the wounds healing at that time rapidly. When large limbs have to be suppressed, they should be well trimmed and coated over with white lead, gum-shellac varnish, clay or other covering, otherwise there is danger of the branch dying back and killing or injuring the tree.

Unruly branches are better tied up with short string till they naturally grow in the position they are meant to occupy. During the first two or three years the trees need to be gone over two or three times during spring and early autumn to remove suckers and lateral growths that may start on the lower side of the limbs, which if left would check the growth of the permanent limbs above and the formation of fruit spurs. Many successful growers prune their full grown apricot trees, if found to be shy in bearing, soon after the fruit is picked, in the early autumn—preferably after a shower of rain (March in Western Australia)—though not too heavily, unless the tree is weakened by overbearing. This develops the buds

for the next year. This operation is only recommended after the trees have reached the bearing age. While the tree is still young and shaping, all the pruning should be done in the winter. If the season is dry a good watering should be given to the trees after this summer pruning.

The management of the fruit branches is much the same as in the case of the cherry; unless the shoot is cut back, the basal bud will remain dormant, as shown in the following illustration of an unpruned branch, and the terminal shoot will grow, lengthening the branch which, long and lanky, will ultimately bend, and, unless propped up, break down under the load of fruit. It is therefore advisable to cut the young shoot at A, (fig. 1.) The sap will thus be forced towards the base and produce new fruit branches, (A, fig 2).



1. Apricot fruit branch, pruning neglected 2. Fruit spur, year after first pruning.
 3. Other fruit spur, year after first pruning.—Dr BAEVIL.

The primitive branch is cut B at *a*, and the new fruit branch A at *b*, in order to obtain the same result. In the last figure the small branch is cut at A so as to force a new fruit branch from the base.

THE PRODUCTION OF WHEAT.

BY PERCY G. WICKEN.

A comparison of the production of wheat in the Australasian States during the past decade supplies some interesting information to wheat-growers. The following tables, compiled from the latest official returns, may be taken as correct :—

WHEAT CROP, 1889.

Colony.	Acres.	Bushels.	Average.
Victoria	1,178,735	11,495,720	9·75 bushels.
New South Wales ...	419,728	6,570,000	15·65 „
Queensland	8,459	134,335	15·88 „
South Australia ...	1,842,961	14,577,358	7·91 „
West Australia ...	35,517	497,238	14·0 „
Tasmania	49,055	756,639	15·42 „
New Zealand	335,861	8,448,606	25·12 „

Totals 3,870,346 42,480,131 10·98 bushels.

Total production of the world, 2,144,891,770 bushels.

WHEAT CROP, 1899.

Colony.	Acres.	Bushels.	Average.
Victoria	2,165,693	15,237,948	7·0 bushels.
New South Wales ...	1,426,166	13,604,106	9·5 „
Queensland	52,527	614,414	11·7 „
South Australia ...	1,821,137	8,453,135	4·6 „
West Australia ...	84,462	966,601	11·4 „
Tasmania	64,328	1,101,303	17·1 „
New Zealand	269,749	8,581,898	31·8 „

Totals 5,884,062 48,559,465 8·3 bushels.

Total production of the world 2,635,564,000 bushels.

From the foregoing figures it will be seen that both New South Wales and Victoria have increased their acreage under wheat during the decade by close on 1,000,000 acres each. Western Australia, Queensland, and Tasmania made small increases, the Western Australian increase being about 50,000 acres, a very small increase considering the amount of land available for cultivation.

South Australia and New Zealand both show a falling off in the acreage sown during the period. South Australia has had to give way to Victoria as the premier wheat-growing State. The grand total for the Australasian States, showing an all round increase of 2,000,000 acres under wheat, are almost wholly due to New South Wales and Victoria.

In spite of this large increase in the area under cultivation the

increase in the yield is only 6,000,000 bushels, only showing a yield of three bushels per acre for the increased area.

The average yield of all the States, with the exception of Tasmania and New Zealand, is very low, and shows a gradual decline, owing, no doubt, in part to the continual cropping of the land with the same crop year after year without any attempt at a rotation of crops, or better methods of cultivation, and partly to the very severe drought experienced in some of the inland districts, which seriously affected the average yield. The Western Australian average, 11·4 bushels per acre, compares very favourably with that of the Australian States, being fourth on the list. New Zealand and Tasmania both show an increased average, that of New Zealand being exceptionally favorable, although showing a decrease of over 65,000 acres sown with wheat, the total yield is over 130,000 bushels more than that of 1889.

The high average of New Zealand, viz., 31·8 bushels per acre, brings that State to a level with the high yields obtained in European countries. Although New Zealand and Tasmania both show increases, the general average yield of Australasia has fallen from 10·9 to 8·3 bushels per acre.

The South Australian yield of 4·6 bushels per acre is exceptionally low, and makes one wonder how wheat-growing can be carried on at a profit with a yield of one bag of grain per acre.

The total increase of the world's production during the period under review is, roughly speaking, 500,000,000 bushels, of which Australasia contributed 6,000,000.

IMPORTS OF WHEAT AND FLOUR INTO WESTERN AUSTRALIA.

1889	{	Wheat	12,332	} bushels.
		Flour, 3,707 tons equal to				185,350	

Total 197,682 bushels.

1899	{	Wheat	78,038	} bushels.
		Flour, 10,945 tons, equal to				547,250	

Total 625,288 bushels.

The highest point in the imports was reached in 1897, when we imported wheat and flour equal to 1,011,849 bushels. From 1889 to 1897, the imports of wheat were gradually on the increase, since which time we have been gradually coping with the demand, but we are still importing very largely of our staple food product. Last year we sent out of the State £86,873 for flour and wheat, which might have been raised within our own borders with benefit to all concerned. The increased demand is due to the large increase of population on the goldfields who produce nothing in the way of foodstuffs, and therefore offer a splendid market for the producer, and tends to show that there is plenty of scope for the wheat farmers in this State for some time to come before we overtake the local demand.

With regard to the quality of our wheats, it is of the highest grade. The F.A.Q. sample weighed 65 lb. per bushel, and compares very favorably with that from any of the other States. It is bright, clean, plump grain, and free from weed seeds. It obtained the Grand Prix at the Paris Exhibition last year, and has been favourably reported on wherever samples have been sent, and I do not think our growers will have any difficulty to find a market when we reach the exporting stage.

LUCERNE.

BY PERCY G. WICKEN.

In last month's issue of the JOURNAL, in an article on the above subject, I made reference to the question of discing the surface of the lucerne paddock after the second year's growth; this is no doubt thought by many to be an extreme step, and likely to injure the crop. At the time of writing I was only giving my own experience on the subject, but during last week a publication has come to hand from the Agricultural Experimental Station, Manhattan, Kansas, U.S.A. In this bulletin Mr. Cottrell, the director, says:—

“Our first experience in discing lucerne was in 1898. A field had been seeded to lucerne in the dry year of 1894, and a poor stand secured. In 1897 this lucerne was heavily pastured by hogs. The hogs were taken off early in the fall and a heavy growth of crab grass came up. The crab grass was so thick and the stand of lucerne so thin that it was not worth keeping.

“Late in March, 1898, this field was harrowed with a disc-harrow, the discs sharp and set at as great an angle as possible. It was immediately cross-discd with the discs set the same way, the ground thoroughly pulverized, and the lucerne apparently destroyed. It soon started, branched out thickly, and we made three cuttings from that field that summer.

“In 1900 we went a step further in discing lucerne. The season was very dry at Manhattan, the rainfall in June being 1.19 inches, in July 4.51 inches, and in August 2.84 inches. Two fields of lucerne two years old were discd.

“One field was discd March 28, the first cutting for hay made May 31; discd June 6, the second cutting for hay made June 25; discd June 27, the third cutting of lucerne made August 13; and the lucerne discd for the fourth time August 20. The last cutting of lucerne was made September 13. This shows four discings and four cuttings of lucerne on upland in a dry year.

“Another field of lucerne was discd and cross-discd on March 27; the first cutting of lucerne was made June 4, and the second discing June 6. Through July and the early part of August the lucerne was cut from day to day and fed green to dairy cows to help out dried up pastures. August 20 the field was discd, and October 3 the last cutting of lucerne was made.

"The lucerne in both fields made fine late fall growth, and went into the winter in good condition.

"The stand of lucerne on both fields disced in 1900 was good. A harrow with sharp 16-inch discs was used, the discs being set at a slight angle—just sufficient to turn the soil over—and the harrow was weighted to make the discs split the lucerne crowns to a depth of at least 2 inches. The discing split the lucerne roots, and this made them throw out many new shoots. The discing made an earth mulch over the field and prevented the evaporation of water, so rapid in a dry time from a lucerne field just after being cut. The discs were so set that they barely turned the soil over, and, running at a depth of 2 inches, they turned the roots of the crab grass and weeds up to the sun, which killed them. These disced fields were clean and free from crab grass in the fall.

"We have not disced one-year-old lucerne. From these experiments we feel safe in recommending discing all lucerne of two years or more standing. Make the first discing early in the spring, and then disc immediately after each cutting. If the stand of lucerne is fair to good set the discs as we did in the experiments made in 1900; if the stand is poor and the growth of crab grass thick set the discs to cut deeply.

"Discing is of as much value to lucerne as cultivation is to corn."

NOTE.—This report completely bears out my remarks on this subject in the previous issue.

FARMYARD MANURE. — We are now told, this time from America, that long dung is superior, even weight for weight, to well-rotted or short dung. It speaks badly for experiments, or even for scientific agriculture, that such statements should be made. Long manure may be better than short for ploughing into the land; but it is absurd to say that weight for weight it is superior. What farmer would prefer a ton of strawy manure to a ton of well-made dung from the middle of a turned heap? Science has never been too popular with farmers; but when they read such statements as that long dung is better than short, weight for weight, they may well fall back upon the experience of their forefathers in preference to the *dicta* of modern "science." One authority informs us that straw is of little or no value as a manure, which is a statement contrary to sound practice; another tells us that strawy or long manure is, weight for weight, superior to rotted manure; another has told us that farmyard manure is injurious to land because it causes the evolution of nitrogen in the free state. Are these samples of the sort of scientific farming which is to be taught at the public expense?

VISIT TO THE CAPEL AND WATERLOO DISTRICTS.

REPORT BY THE V. AND H. EXPERT.

The V. and H. Expert, Mr. Despeissis, reports to the Secretary of the Department of Agriculture:—

"I have been able last week to comply with the requests made by the Capel Farmers and the Waterloo Farmers and Fruit-growers' Association, to meet the members of these Associations and give them a demonstration of pruning vines and fruit trees. The call on my time has been too pressing to enable me to visit orchards singly and proffer the necessary instruction in pruning where required, but applications with that object in view from organised associations are much more easily satisfied.

"Both meetings were well attended by local growers, and I trust the information I have been able to impart may be of use to them.

"At the Capel, fruit trees both young and in bearing were pruned at Mr. G. Dilley's orchard at the Capel Bridge, and in the afternoon vines were pruned in an old-established vineyard at Mr. G. Payne's farm, a few miles up the river.

"This same river runs through the Stirling Estate, which the residents hope will be acquired by the State for subdivision and close settlement. Thousands of acres of land as suitable for intense culture as is Mr. Dilley's are found on that estate, which lies between Bunbury and the Vasse.

"The next day, as arranged by Mr. Fred Woods, the Secretary of the Waterloo Farmers and Fruitgrowers' Association, a pruning demonstration was given at Mr. Hyde's orchard, after which I had an opportunity of visiting the promising young orchard established by Mr. Woods on Mr. Money's farm, also on the Waterloo plains. Both orchards show the most striking contrast with the surrounding plains, the fertility of which, if judged from the window, seems of a low order. Drainage, cultivation with the help of some little fertilizers, and some quick-growing wind-breaks so alter the nature of the locality that the trees and vines when young waste an astounding amount of energy in wood production, while later, when more mature, they have been proved to yield heavy crops of fruit."

NEW PUBLICATIONS.

Since our last issue we have received a copy of a report on the *Romulea rosea*, by Mr. Elms, Government Entomologist of Tasmania. This objectionable bulbous plant is well-known to us here by the name of the Guildford or "Nobby" grass. In our next issue we will give the context of the report. We have also received the first issue of a new weekly paper published in Launceston, and called the *Weekly Courier*. It is full of crisp, well written and interesting matter, profusely illustrated, and altogether the production is an acquisition to the list of our weeklies.

ANGORA GOATS.

In the January number of the JOURNAL an article was published calling attention to the value of the Angora goat as clearers of scrub lands, and since that time the Department of Agriculture has been making attempts to secure a number of goats. Mr. P. Wicken, of the Department of Agriculture, recommended the purchase of three does and a buck as a commencement of a stud flock, but, on an attempt being made to secure these from various breeders, it was found that the Department of Agriculture in Queensland and New Zealand had purchased all the available does, and also booked orders for all the progeny for the next season, and this Department could only obtain the offers of bucks. Further communications are now being made, and the Department hopes to be successful in obtaining a small flock for experimental purposes. Mr. Forest-ranger Patterson, in a letter advocating their introduction, says :—" When in the East, and living in the Never Never country, a district of devastating droughts interspersed with an occasional prolific season, I have had ample evidence of the superiority of the hardihood of goats over sheep. In the more horrible droughts I have seen the carcasses of thousands of sheep and cattle polluting the dams and tanks, and scrub-cutting daily practised to sustain the life of the stock left, and during such time the goats kept in good condition without artificial aid, and supplied the only eatable mutton in the district. There is a prejudice with many persons against the use of goat's flesh, which is, however, most palatable, and not easily discernible either in appearance or flavour from mutton, as any person who has travelled in the back country can testify."

SHEEP AND ANGORAS COMPARED.

Professor Thomas Shaw, of Minnesota, thus compares sheep and Angora goats :—

1. There is not much difference in the size of the two animals when matured, but the sheep matures much more quickly than the goat.

2. The goat lives to a much greater age than the sheep. Some authorities claim that the average length of age of a goat is about twice that of a sheep.

3. The goat is a browser, and will from choice gather its living from leaves, twigs, bark of trees, and weeds, whereas sheep prefer pastures, although they will eat many weeds also, but will also eat leaves and brush, but not in preference to pasture.

4. The meat of the sheep is as yet preferred on the whole in the markets, but the goat meat is coming more and more into favour.

5. The goat produces hair, and the sheep wool. The fleece of the latter weighs more on an average than the fleece of the former, and will probably bring more on the market.

6. The great use of sheep on the average farm is to clean up scattered vegetation, especially what is of the gleanings order, while the best use of goats is in cleaning up brush land.

7. Sheep will not do well if confined wholly to brush land, while just such land furnishes exactly the conditions which the goats enjoy.

The accompanying extract from the American *Prairie Farmer* gives an account of the history of the Angora goat :—

HISTORY OF THE ANGORA GOAT.

The Angora goat is a native of Asia Minor, and up to 1880 it was possible to purchase them in that country, but the Turks and Armenians became envious of the great advancement made in South Africa, and prevailed upon the Sultan to prohibit the exportation of any more goats. We are indebted to the enterprise of a few progressive Americans for those that were brought into the United States, and although the entire number aggregates less than 100 head, they have been sufficient to demonstrate the entire feasibility of breeding them in all sections of our country, and it is believed by many that our climate is capable of producing a class of mohair superior to either Turkey or South Africa. The first lot of goats imported numbered about 30 head, and were presented to the Hon. J. B. Davis, American Minister to Turkey, in 1847, by the Sultan himself. They were doubtless of the best and purest blood that could be obtained, and soon after their arrival in this country Mr. Davis disposed of them to his friend, Col. Richard Peters, of Atlanta, Ga., who bred them with great care up to the time of his death, which occurred in 1891 or 1892. The progeny of this lot of goats has been scattered over the whole country, and was the initial step of the foundation of our mohair industry. The present available supply of mohair from all sources may be placed at between 18,000,000 and 20,000,000 lb., only 500,000 lb. of which is produced in this country, the remainder being divided about equally between Turkey and South Africa. It has been fully demonstrated that the Angora goat will thrive in all sections of the United States, but will perhaps do better in high and dry districts than in low lands. They are a great advantage in keeping down undergrowth in pastures, and have been purchased for this purpose in many cases by parties in Iowa. A common herd of goats can very easily be improved by the introduction of Angora blood, and it is very difficult to distinguish the fourth cross from pure-blooded goats. The value of these goats consists mainly in the length and lustre of the hair they produce, but this is not attained in improving a common flock until the fourth crossing, which makes it very expensive to undertake, and may account to a large extent for the slow progress that has been made by Americans in building up the industry. The bucking season begins about July, but this is not a good time, as the young kids come during the winter, and unless they are sheltered, and the mother furnished with proper food, they will die. The period of gestation is five months and a few days, and it is advisable to

separate the males from females about the 15th June, until such time as will be proper to bring the kid after vegetation has started in the spring. The Angora rarely produces more than one kid at a time. The male is capable of producing at the age of six months, and the female will begin breeding about the age of one year, though it is advisable to keep her from it until the following season, if it can be done without great trouble. Shearing must be done as soon in the spring as the hair commences to shed. If left longer the oil in the hair goes into the body of the animal, and the hair loses its life, weight, and lustre. If the weather is cold, proper shelter should be afforded the animals for a short time after being shorn.

The hair should be packed according to quality, length of staple being the best guide as to grade. If the flock is of uniform grade, the hair may be packed in a sack loose, but if there are two or more lengths of staple it is advisable to tie each fleece separately so as to assist in a proper classification when sent to market. The writer was first attracted to the Angora goat as being a most excellent substitute for the wild fur-bearing animals so rapidly becoming extinct. The buffalo, which has supplied buggy and carriage robes for so many centuries, has been exterminated, and nearly all other kinds of fur are very rare and expensive. The demand for this class of product has always been enormous, and a glance over any fur dealer's price list will convince anyone that the fur industry is one of great promise. There is no domestic animal that can supply this great demand of the human family better than the Angora goat, inasmuch as the skin can be taken in such a variety of stages. For instance, when the hair is of one month's growth it can hardly be distinguished from the Ast'achan, if dyed black; or it can be taken at an earlier period of growth, and be made to represent the Polar or Black bear, according to the character of dye used. It may not be known that nearly all the buggy robes that are now sold as wild animal fur are nothing more than goat skins dyed. And perhaps young ladies who admire the so-called "real monkey skin" muffs and cloaks will be surprised to learn that they are only straight-haired goat skins dyed-black. One of the most profitable uses that the Angora goat skin is put to is in making lace trimmings, which commands a price per yard equivalent to 15 dollars for a single hide. Another use is in making floor rugs and coverings for the backs of sofas and armchairs. The beautiful lustre of the curly hair is brought out in a most effective manner by the reflection of gas light, and nearly all housekeepers who have not already some of these rugs, etc., are anxious to possess some. The supply of this class of rugs is limited, and the price, until recently, was very high—10 dollars and 12 dollars being often paid for choice skins. The present market value of Angora goat skins in a raw state is about 2 dollars each for well-haired skins, and were it not for the enormous importation of foreign skins, particularly Chinese, which are brought here by the thousands of bales, owing to there being no import duty on them, the price for our home product would be much higher. It may be well perhaps to state

that the Chinese goat skin does not compare in fineness with the Angora, yet they are used extensively for cheap buggy robes and rugs, which naturally depreciates the selling value of the better article. The Angora goat-raisers intend to ask protection from such unfair competition, at the hands of our next Congress, and it is not unlikely that their demands will be granted. If the Chinese are not permitted to become citizens of this country, it is an outrage that we should be compelled to compete with their cheap labor at home. With a reasonable tariff to keep out the flood of foreign skins, there is no industry that can be made more profitable than the raising of goats for their skins alone. The meat of the Angora is of a very delicious character, although there is still a lurking prejudice in the minds of some on account of the strong flavor in the flesh of the common goat. This prejudice is rapidly being removed, however, and it will not be many years before Angora goat meat will be as much in demand as the choicest mutton is to-day.

Goats are among the most profitable stock on a farm. Those who go into the goat business extensively always find it profitable, but a small flock on every farm that has brush is nearly all profit. There is no animal that converts the weeds and brush into ready money like the Angora goat. They will eat almost every kind of weed that grows—even the jimson. They seem to be a blight to brush; they eat the leaves, and the parent stocks soon die off. If they do not clean-cut your fence corners it is because they do not have a chance. Their wool is more valuable than sheep's wool, and one goat will eat more brush than five sheep. We are glad to be able at last to report a decided and legitimate improvement in mohair, with an excellent demand at advancing prices, and the prospects of a steady, active trade during next fall and winter. Values in Europe have rapidly risen to the highest point known in years, with only small stocks available until the next Turkish clip. In view of the situation we feel safe in quoting for average domestic combed mohair 30 to 33 cents: good average, 35 cents; superior, 38 to 40 cents; and really choice selected, 42 cents or more. We advise all Angora goat-breeders to use only pure-bred bucks, and only the very best. Our best consignors, those that are making the most money out of the goat business, are the men who have expended the most money for pure-bred bucks, and have been the most careful in breeding long, lustrous fleece. At present prices there is a fortune for the man who can raise fine mohair, and only disappointment and failure for the man who raises kemp. Shippers and mohair growers generally should shear only such of their flock as will yield a fleece of 6 inches staple or upwards, and thereafter, when it is practicable, let it grow to a full year's length if they want a full-grown price.

A number of breeders pretend to have pure-bred goats, but in the face of the fact that there never have been more than 100 goats imported into the United States, and these were brought in from 20 to 50 years ago, is it a great stretch of imagination to suppose they have not been kept pure? We are of the opinion

that there are no goats in the United States to-day that can be called pure-bred with anything like absolute certainty. A very high regard is always manifested for pure-bred stock, and importation from abroad has invariably proved to be an excellent card for the breeder. We consider this a great error, and in defence of our opinion will point to the Spanish merino sheep, which has been so greatly improved by American breeding over the original stock that the American merino sheep is now preferred by breeders in all nations. The same experience has been realised with the hog, shorthorn cattle, racehorses, and, indeed, nearly all kinds of stock that the Americans have undertaken to improve. We predict the same result with the Angora goat. Our first start in goats came from the Peters' flock in Georgia at 60 dollars per head, and we can show animals to-day far superior to those purchased from Mr. Peters. Our experience has been that any goat of good qualities will breed well, and if a beginner will select only animals that are well coated with hair he need not be afraid of results.

DISHORNING CATTLE.

It will be remembered that in March last the Society for the Prevention of Cruelty to Animals proceeded against the Department of Agriculture for dishorning a savage Jersey bull. The Society maintained that the operation was illegal, and produced in evidence reports from Scotch Veterinary Surgeons against the practice. The Secretary of the Department caused a letter to be sent to James MacDonald, Esq., F.R.S.E., Secretary of the Highland and Agricultural Society of Scotland, asking "if the dishorning of adult cattle is generally practised in Scotland, and is the operation legalised." In reply Mr. MacDonald writes as follows:—

"The practice of dishorning cattle is, curiously enough, legal in Scotland, but illegal in England. About 10 years ago the English Courts declared the process illegal. About the same time the Society for the Prevention of Cruelty to Animals raised the question in the Scotch Courts, but there it was decided that the operation is not illegal, the presiding Judge stating that where cattle fed together in courts are troublesome, the total dishorning, which effectively prevents them from injuring each other by goring, is for the benefit of the cattle themselves, and that other methods suggested for the prevention of this injury are not so effective. It would seem that the chief explanation of this difference in the decisions of the Scotch and English Courts is, that while the Scotch Statute for the Prevention of Cruelty to Animals declares that 'wanton' cruelty to animals shall be illegal, the corresponding Statute in England does not contain the word 'wanton.' The legality of the question has remained in this position for about 10 years, and the practice of dishorning is followed largely throughout Scotland, mostly in the case of Irish cattle, large numbers of which are brought into Scotland for breeding purposes."

TESTING COWS FOR TUBERCULOSIS.

C. S., Berlin Heights, O., asks how cows are tested for tuberculosis. The method of applying the tuberculin test to cows in New York State is as follows:—The temperature of the animal is taken. Then about 30 drops of tuberculin are injected through the skin of the neck or shoulder. This is the proper amount for animals weighing about 1,000 pounds, and it would be varied according to weight. After eight hours the temperature is again taken, and at intervals of two hours thereafter, during the following day. Usually those showing a rise in temperature of three or more degrees are condemned as tuberculous. Some animals, though healthy, vary two to four degrees under changed conditions, or at different times of the day, and it is a good plan to learn the habit of the animal in this respect by making several temperature tests previous to using the tuberculin. In Canada *five* of these preliminary tests are required. The normal temperature of some cows is also as much as two degrees above others, and there are conditions under which the system is susceptible to an injection of tuberculin, even though the animal is not diseased. Dr. James Law says that at the time of the test the cow should not be within three weeks of calving, should not be exposed to a hot sun or cold draughts, or put into a close stable. Heavy cows accustomed to a ground floor sometimes show fever if made to stand on hard boards, and the same may be caused by omission in milking, delay in watering or change in food. These things show the need of experience and good judgment in handling the test. Some people have needless fears, however. If the tuberculin is properly prepared there is not the slightest danger of its conveying disease germs into healthy animals. The tuberculin used in testing cows is made by artificially cultivating under favorable conditions the tubercle bacillus. The tuberculin itself is a waste thrown off by the bacillus. It is subjected to a boiling temperature, which would kill any germs that might be in it; then filtered so closely that all dead germs are removed, and thus made absolutely sterile. This waste product is highly irritating to the tubercle bacillus. When injected under the skin of an animal in which tuberculosis is present, the bacilli living in the tissues are irritated as soon as the tuberculin in working through the system reaches them, and they become exceedingly active, causing a rise in temperature, or fever. The test is safe, and in most cases accurate when used by careful operators who know what they are about. Those who do not know how to handle it, or jump at unwarranted conclusions, are liable to condemn healthy animals.

Farmers living at a distance from town should before going to buy, make a list of all articles wanted. A small note book should be kept for the purpose. This will save time and prevent annoyance.

ENSILAGE-MAKING ON THE MURCHISON.

Mr. A. W. Bolden, writing from Peak Hill under date of June 13, says:—"According to a promise made some 12 months ago I am writing to tell you that the ensilage made here by me in a pit turned out very good indeed. It was no good for about six inches on top and bottom, and from nine inches to a foot on each side; inside of this it was a bright amber-colour and full of sap; my cows eat it greedily, and milked splendidly upon it. My pit was 6 feet deep, 10 feet wide, and 16 feet long. I filled it up in the first instance three feet above the surface, weighted it with logs, and left it three days; it had then settled down about five feet; I filled it up again three feet above surface, covered it over with old bags; on top of the bags I placed a layer of boards, procured from broken up beer and whiskey cases, just laid loose all over the surface; I then put three feet of loose earth on top. I looked at it occasionally, and filled up any cracks in the earth. After leaving it for eight months I opened it, when I found three feet six inches of ensilage. The pit, I may add, was just a hole dug in the earth, left with the walls of earth, with no lining of any sort. I could not make the pit any deeper, as I struck cement rock at six feet, and the expense would have been too heavy to have gone on sinking into it."

Mr. A. Crawford, the Dairy Expert to the Department, in commenting on the above letter, says:—"I am glad to see this report, for it proves that dairying can be carried on successfully even in the back blocks. If Mr. Bolden is going in for ensilage-making extensively he would find that he would have practically no loss at all on the sides if he made his pit deeper. To obtain the best results a pit should be at least 10 to 12 feet deep, and better still if carried down to 15 or 20 feet. When a deep pit is used little or no outside pressure is required. Stack silage is much to be preferred to none, but the percentage of loss is very high. While, in the pits, with the exception of the top, there should be practically none."

SHELTER FOR STOCK.—The importance of shelter for all stock, but especially dairy cattle, during the winter months, should not be ignored. A very considerable portion of the food consumed by stock is expended in the maintenance of the natural heat of the body and the colder and bleaker the conditions the greater the proportion of food required for this purpose. It is economy to keep stock warm, as a greater proportion of the food consumed will go to making meat or milk. Some of the dairy farmers in South Australian State provide every one of their cows with covers made of wheat bags or similar material, and their experience is that the increased yield of milk amply repays any trouble and expense incurred in this way.—*Martin's Farm and Home.*

THE INSECT PESTS AMENDMENT ACT, 1898.

ORDER IN COUNCIL.

At the Executive Council Chamber at Perth, this 15th day of, July, 1901.

Present—His Excellency the Governor, the Honourables the Attorney-General Colonial Treasurer, Minister for Lands, and Minister for Mines.

WHEREAS by "The Insect Pests Amendment Act, 1898," the Governor, by Order in Council gazetted, may from time to time make such Regulations as he deems necessary for the purposes mentioned in Section 14 of the said Act: AND WHEREAS I, the Hon. Sir ARTHUR LAWLEY, K.C.M.G., Governor &c., &c., &c., deem it necessary that all regulations heretofore made under this Act shall be revoked, and other regulations made in lieu thereof for the purposes of the said Act: NOW THEREFORE I, the said Governor, by and with the advice and consent of the Executive Council, do hereby order and proclaim that the regulations made on the 25th day of January, 1899, under an Order in Council gazetted, the 3rd day of February, 1899, and all other regulations made under the said Act be revoked, and I do hereby in lieu thereof make the following Regulations for the purposes of the said Act.

(Signed) F. D. NORTH,
Clerk of the Council.

1. Vine Cuttings may be imported from any country or State of the Commonwealth provided that any person about to import such cuttings shall at the time of ordering the same furnish a duplicate of such order to the Secretary of the Department of Agriculture and provided also that such cuttings shall not be imported for at least one month after the duplicate of such order shall have been so furnished as aforesaid.

2. All vine cuttings so imported pursuant to the next preceding order shall be absolutely surrendered to the Chief Inspector or Local Inspector at the port of debarkation for the purpose of being quarantined as hereinafter provided.

3. All vine cuttings imported as aforesaid shall be quarantined by the Department of Agriculture for a period of not less than 12 months nor longer than two years upon such grounds as from time to time shall be set apart by the said Department by advertising in the *Government Gazette* as quarantine stations. The consignee agent or other person engaged or concerned in the importation of any such vine cuttings as aforesaid shall at the time of delivering the same to the Department of Agriculture for the purpose of being quarantined pay to the Secretary of the Department of Agriculture a sum of 2s. 6d. for every 100 cuttings so delivered and at the expiration of the period of quarantine shall upon taking delivery of his rooted vines pay the further sum of 2s. 6d. for every 100 rooted vines so delivered to him.

4. Any vine cuttings imported which are at the time of landing in the opinion of the Chief Inspector or Local Inspector

affected with insects fungi blight or other diseases injurious to grape vines or other trees or plants shall be destroyed under the direction of the said Inspector and the expense connected therewith shall be borne by and recoverable from the importer of such vine cuttings.

5. The Department of Agriculture shall not be liable for any loss resulting from the destruction of any cuttings under the provisions of the preceding paragraphs or by reason of the infertility of any such cuttings while in or after leaving their custody or whilst under their control.

SCHEDULE.

Scale of Fees to be paid for the Inspection and Disinfection of Vine Cuttings and Buds.

	s.	d.
100 or less	2	6
Over 100 and not more than 500	5	0
Over 500 and not more than 1,000	10	0
Over 1,000—for every additional 1,000 or part thereof	2	6

Disinfection of Imported Trees Plants Cuttings (other than Vines) Grafts Buds Seeds Pits Scions and Fruits.

6. All consignees agents or other persons engaged or concerned in the importation into Western Australia of any fruit fruit-trees plants cuttings buds (other than vine cuttings or buds) seeds pits or scions shall within twenty-four (24) hours after the arrival of any such fruit fruit-trees plants cuttings buds seeds pits or scions at the first port or place of debarkation in the State of Western Australia deliver the same to the said Chief Inspector or Local Inspector and in the event of any such consignee or his agent failing to so deliver any such fruit fruit-trees plants cuttings buds seeds pits or scions within twenty-four (24) hours as aforesaid the Chief Inspector or Local Inspector shall seize the same. If upon such seizure the said fruit fruit-trees plants cuttings buds seeds pits or scions are found to be infested with any injurious insects (or their germs) or with fungi blight or other diseases injurious to fruit or to vines or fruit-trees or to other trees or plants the said Inspector shall immediately destroy the same but if the said fruit fruit-trees plants cuttings buds seeds pits or scions are found on inspection to be free from injurious insects (or their germs) or from fungi blight or other diseases injurious to fruit fruit-trees vines or other trees or plants the said Inspector shall treat the said fruit fruit-trees plants cuttings buds seeds pits or scions as may be directed by the Secretary of the Department of Agriculture and hold same until applied for by the consignee or agent Provided that if the same be not applied for within seven clear days from time of seizure the same may be destroyed.

7. All fruit fruit-trees plants cuttings grafts buds seeds pits or scions imported into the State of Western Australia are hereby

required to be disinfected by the Chief Inspector or Local Inspector immediately upon arrival at the port or place where they are to be unloaded. If any of the said fruit fruit-trees plants cuttings grafts buds seeds pits or scions are found to be infested with insects (or their germs) or with fungi blight or other diseases injurious to fruit or to fruit trees or to other trees or plants they shall remain in quarantine for a period of fourteen (14) days or until the Chief Inspector or Local Inspector can determine whether the said trees plants cuttings grafts buds seeds pits or scions are free from injurious insect pests or their eggs larvæ or pupæ.

8. All peach nectarine apricot plum prune almond and all trees budded or grafted upon peach stocks or roots and all peach or other pits cuttings buds or scions raised or grown in any place where the "peach yellows" or the "peach rosette" are known to exist are hereby prohibited from being imported into the State of Western Australia.

9. The importation into any port in Western Australia of any fruit plant or part thereof infested with the codlin moth mussell scale Queensland fruit fly phoma citricarpa phyloxera the San José or pernicious scale the mining or chionospis scale the wax scale or with internal parasites such as the larvæ of the codlin moth fruit flies nematodes or bacterial diseases with melanose fungus or with any pests parasites or fungi which may from time to time be declared as such by the Governor in Council under Section III. of the Insect Pests Amendment Act 1898 is absolutely prohibited.

10. Fruit fruit-trees plants cuttings buds seeds pits or scions of any kind (not otherwise prohibited) not grown in Western Australia must before removal from the first port or place of debarkation be examined by the Chief Inspector or Local Inspector and if found infested with any insect or insects (or their germs) or with any fungi blight or other diseases not specified in Order 9 known to be injurious to fruit or fruit trees or to other trees shall be destroyed or otherwise treated as the Secretary of the Department of Agriculture may direct. After inspection and disinfection the Chief Inspector or Local Inspector shall issue a certificate after the cases or packing or transportable material in which such fruit was packed has been disinfected as prescribed by Order 11 and on receipt of the fee for inspection and disinfection prescribed in Schedule I hereto.

11. Soil or compost in pots cases or packages and transportable material of any kind used for packing or surrounding fruit is hereby prohibited from being removed from the first port or place of debarkation or from being offered for sale gift distribution or transportation until the said material (unless otherwise directed by the Secretary of the Department of Agriculture) has been disinfected by dipping the same and keeping it continually submerged for a period of not less than five (5) minutes in boiling water containing in solution not less than one pound (1 lb.) of concentrated potash to each and every ten (10) gallons of water.

12. Fruit cases containing vegetables or vegetable matter other than fruit imported into the State are also hereby required to be disinfected as per Order 11 before removal from the first port or place of debarkation.

13. Consignees must deliver within twenty-four (24) hours of arrival the fruit fruit-trees packages and transportable material requiring disinfection to the Chief Inspector or Local Inspector and unpack and prepare them for disinfection. After disinfection consignees or their agents must repack the fruit fruit-trees vine cuttings packages or transportable material that have been disinfected and remove the same within twenty-four (24) hours.

14. Any fruit fruit-trees vine cuttings packages or transportable material delivered to the Chief Inspector or Local Inspector for disinfection and not disinfected within forty-eight (48) hours by reason of the default of the consignee to provide the necessary labour for unpacking and re-packing may be destroyed by the Chief Inspector or Local Inspector.

15. Agents and other persons engaged or concerned in the importation of fruits and of fruit-trees plants cuttings buds (other than vine cuttings) or buds seeds pits and scions are required to register their names and places of business with the Secretary of the Department of Agriculture and on payment of the sum of Five shillings a certificate of registration will be issued entitling such agent or other person to import fruit fruit-trees plants cuttings buds seeds pits and scions subject to the provisions of "The Insect Pests Amendment Act 1898" and regulations thereunder and such agent or other person shall pay for the inspection and disinfection thereof the fees set out in Schedules I and II respectively:—

SCHEDULE I.

Scale of Fees to be Charged for Inspection of Fruit.

	s.	d.
28lbs. or under	1	6
Over 28lbs. and not more than 56lbs.	3	9
Over 56lbs. and not more than 112lbs.	5	3
Over 112lbs. and not more than 224lbs.	7	6
Over 224lbs. and not more than 448lbs.	15	0
Over 448lbs. and for every additional 112lbs. or part thereof...	1	0

SCHEDULE II.

Scale of Fees to be paid for the Inspection of Trees, Plants, etc., of all Descriptions other than Vine Cuttings.

	s.	d.
25 or less	1	6
Over 25 and not more than 50	3	9
Over 50 and not more than 100	5	3
Over 100 and not more than 250	7	6
Over 250 and not more than 500	11	3
Over 500 and not more than 1,000... ..	15	0
Over 1,000 and not more than 5,000	37	6
Over 5,000 and not more than 10,000	75	0
Over 10,000—for every additional 1,000 or part thereof ...	7	6

Registration of Orchards Vineyards and Nurseries

16. The owner or occupier or person in charge of any orchard garden nursery vinery vineyard or hot-house or any land used for the purpose of growing or cultivating any plants shall register the same with the Secretary of the Department of Agriculture at Perth in the form of the accompanying schedule and at the same time forward for registration fee the sum of 2s. 6d. for an area of one acre or under and the sum of 5s. for an area exceeding one acre.

Any person failing to comply with this order is liable to a penalty not exceeding £100.

SCHEDULE.

Insect Pests Amendment Act, 1898.

Magisterial District.....Collector's District.....(By Collector's District is meant the police patrol district). Names of owner and occupier and person in charge.....Name of holding for which this return is supplied.....Postal address.....

I hereby certify that, to the best of my belief and knowledge, the above particulars are correct.

Signed.....

Fee of () herewith.

17. All packages sent away from any nursery containing fruit fruit-trees vines or other vegetation intended for sale distribution or gift must be legibly marked with the name and address of the consignor and consignee and a descriptive invoice of the contents must accompany same together with a certificate to the effect that such contents have been disinfected as may be prescribed from time to time by the Secretary of the Department of Agriculture and are free from insects fungi blight and all other diseases attacking fruit fruit-trees and other vegetation.

18. Any vendor of fruit grower dealer or auctioneer who shall sell or attempt to sell or offer or expose for sale any fruit fruit-trees plants or other vegetation effected with the codlin moth mussell scale Queensland fruit fly the phoma citricarpa phylloxera the San José or pernicious scale the mining or chionospis scale the wax scale or with internal parasites such as the larvæ of the codlin moth fruit flies or nematodes or bacterial diseases or melanose fungus or with any other diseases which may from time to time be declared as such by the Governor in Council shall be liable on conviction to a penalty not exceeding One hundred pounds (£100) and any Inspector or other authorised person shall seize and destroy such infected fruit and the cost of such seizure and destruction shall be at the expense of and recoverable from the person selling or offering the said fruit for sale gift or distribution.

19. No compensation will be paid for any fruit trees plants cuttings buds seeds pits scions cases packages or transportable material destroyed under these regulations.

20. The use within the State of second-hand fruit cases or cases or packages that may reasonably be supposed to have

contained fruit is prohibited and the Chief Inspector or Local Inspector may order the disinfection of same as provided in order 11 or by any other means that may be directed by the Secretary of the Department of Agriculture and failing such disinfection may seize and destroy same.

21. Inspectors or other authorised officers or any officer of Customs may in respect of any imported fruit demand the production of a certificate by a Government Inspector at the port of shipment declaring that such fruit has been examined before shipment and found to be clean and free from all disease.

22. The foregoing orders do not apply to any port or part of the State of Western Australia North of the 26th parallel of South latitude.

23. The importation into the State of Western Australia South of the 26th parallel of South latitude of apples pears and quinces is prohibited except through the ports of Albany and Fremantle.

F. D. NORTH,

Clerk of the Council.

LOCUST FUNGUS.

The Secretary of the Department of Agriculture has had his attention drawn to the successful use of locust fungus in the destruction of grasshoppers in Victoria. The Horticultural Expert of the Department states:—"The destruction of locusts by means of a parasitic fungus (*Mucor racemosus*) has now passed from the domain of experimentation into that of everyday practice. The method which has been tried in various places where swarms of locusts proved troublesome to vegetation, notably South Africa, has been for the past two or three years successfully applied in Victoria by Mr. C. French, Government Entomologist of that State. I would recommend that a small consignment of the fungus be obtained from Mr. French's laboratory early next spring, when locusts are on the move. These could be posted every week all through October, and on arriving I would from these tubes prepare the cultures and arrange for the wholesale infection of locusts in several districts, so as to fully test the value of this method of destruction. The locusts are more easily destroyed when in the early or hopping stage, and when dead they turn a liver color. The inoculation is by means of water cultures or breadcrumb cultures. It is more efficacious when the temperature ranges from 70° Fahr. upwards, and when the weather is showery and dew comes down at night." The Secretary wrote to Mr. French asking him if he would send some fungus, and in reply Mr. French informed the Secretary that he would be pleased to do so as soon as he had some prepared.

GARDEN NOTES FOR JULY.

BY PERCY G. WICKEN.

Although the month has been ushered in with fine, bright weather, and severe frosts in nearly all parts of the State, this can hardly be expected to continue, as we generally expect to get our heaviest rainfall during July. Though the land may be dry at the present time, precautions to drain off the surplus water should not be neglected, and all drains should be cleaned out, and the outlets kept free from weeds and rubbish, so as not to impede the flow of water. Young plants in gardens likely to be affected by the frost can be protected by covering with light bushes or tea-tree, or by being covered with loose straw, or for seed beds light frames covered with calico can be used. These can be placed over the bed at night, and removed in the morning when the sun is fairly well up.

Apply all the stable manure obtainable to the ground, and dig well in—at least 20 tons to the acre should be applied to be of much service. This may seem a heavy dressing, but when you come to reckon it out, and find that it only gives about 6lbs. of manure to the square yard, it does not seem such a large quantity. Where stable manure cannot be obtained, resource must be had to the artificial fertilizers, and then only those containing the ingredients required for the crop should be purchased. Highly soluble manures should only be applied in good weather, and as a top dressing, so that the plant is able to absorb the food before it sinks beyond the reach of the roots.

BROAD BEANS.—A few rows may be sown; those from previous sowings should now be growing well. This plant will succeed best on a stiff soil, but it will bear a crop on almost any soil.

CABBAGE.—Sow a little seed so as to keep up a succession, and plant out any suitable plants from the seed bed.

CARROTS.—Thin out any plants that are coming up too thickly, and plant a little seed so as to keep up a supply.

CAULIFLOWER.—Sow a little seed, and plant out any plants that have grown large enough in the seed bed.

CUCUMBERS.—Those desiring to have early cucumbers for market should sow in hot beds during this month. In the warmer localities they may be planted in the open, but must be protected from the frost at night.

ONIONS.—May be sown freely this month, but require a well-worked and well-drained soil. Sow in drills and thin out to about 8 inches apart, according to size and variety, or they may be transplanted from a seed bed.

PEAS.—Sow largely in drills from 2 to 4 feet apart according to variety, if the tall varieties are staked the pods are much easier gathered. Yorkshire Hero, Stratagem, and Veitch's Perfection are some of the best running varieties, while the dwarf varieties are McLean's Little Gem and William Hurst. The manures most suitable for this crop are superphosphate and kainait, or sulphate of potash may be used where kainait is not obtainable.

POTATOES.—Early varieties may be sown at the end of the month in well-protected localities.

TURNIPS.—A few rows may be sown for home use, but it is too late to sow for a main crop.

TOMATOES.—Some seeds may be sown in boxes in sheltered positions, or under glass, so as to raise some early plants.

FARM.—The bulk of the cereal crops having now been sown, operations are somewhat slack in this direction. Where the land is not too wet a good harrowing of the wheat crop when about 6 inches high is very beneficial. If the wheat is growing rank and lying down—what is known as “interproud”—it is very profitable to turn a mob of sheep on to the crop and eat it down; this induces the wheat to stool out, and also manures the crop. In carrying out this operation it is best to turn as large a mob of sheep in as possible, so as to eat it off in a short space of time. It is not advisable to have a small number of sheep continually nibbling at the crop, which will not stand continual feeding if required for hay or grain. Rape, mustard, and such crops should be now fit for feeding sheep. If, after eating a crop of rape down to the ground, the sheep are removed for a time, a second growth soon springs up, and in favorable localities a third crop may also be obtained. Mustard is a very good sheep feed for the winter months. In feeding sheep on turnips, rape, mustard, or any cultivated crop, it is not beneficial to let them on to too large an area at one time, as they destroy more than they eat. A cheap portable fence can easily be erected, and the stock (sheep or pigs) allowed on to a fresh portion whenever required; by this means much waste is avoided.

A WARNING TO NURSERYMEN.

Section 17 of the Regulations under the Insect Pests Act provides that all packages of fruit trees and plants sent away from any nursery, must be accompanied by a descriptive invoice, together with a certificate to the effect that the trees or plants described therein have been disinfected according to the treatment prescribed by the Secretary of the Department of Agriculture.

A case in which a nurseryman failed to issue a certificate, as provided in this Section of the Regulations, has recently been reported to the Department, and the offending nurseryman will be called upon for an explanation on the subject. As there is nothing of greater importance to the orchardist than planting healthy trees, growers should be careful to see that they receive a certificate showing the trees forwarded to them have been disinfected in accordance with the Regulations. Nurserymen should note that in failing to supply certificates with goods they are infringing the provisions of the Act, and thereby render themselves liable to prosecution.

MARKET REPORT.

FOR MONTH ENDING JULY 10.

The W.A. General Produce Co. report sales effected for the following articles on account of various consignees, for the month ending July 10:—Business for the past month very good, supplies generally very fair, prices obtained very satisfactory. Bacon, stocks very good, sales regular and increasing. Hams, Hutton's and Farmer's continue in favour, and for both lines some very heavy sales effected. Butter, very scarce on spot, values f.o.b. quite firm. Lard, still in good demand. Cheese, unaltered, with usual outlet. Eggs, local, supplies easing somewhat, prices of late very unsettled, but likely to firm. Potatoes have had a big rise, f.o.b. Melbourne, and in fact throughout all sources of supply. Onions, still unaltered. Chaff, supplies have been regular with values as hitherto. Bran and pollard in very good demand, supplies not over plentiful. Flour, local is ruling at higher rates than imported, hence importation increasing in consequence. Oats are quite firm, and believed to further rise soon. Wheat, an advance of 1d to 2d per bushel reported, f.o.b. Melbourne and New Zealand. Fruit, local sorts arriving in fair quantities, which find ready sale, especially mandarines and oranges. Imported lots, some heavy consignments expected during next week. Vegetables, supplies have been kept up with values moderate to good. Poultry, prices a little better, but confined to table birds, principally young roosters. Carcase pork, 40 to 70lb., if cleanly dressed, sells well. Artificial manures in great demand.

Farm and Dairy Produce.—Bacon sides—10d, 10½d to 11d per lb. Hams—Hutton's or Farmer's, 1s 2½d per lb. New Zealand, 1s 1½d per lb. Butter—Victorian, 1s 6d to 1s 7d per lb. New Zealand, 1s 4½d to 1s 5d per lb. Queensland, 1s 3d per lb. Lard—In 1lb. and 2lb. tins 9d per lb.; 4lb. tins 8½d per lb. Cheese—Mediums, 8½d per lb.; loaf, 9d per lb. Eggs—Local, from 1s 6d to 1s 9d per doz. Potatoes—Imported, £9 per ton. Onions—Imported, £14 per ton. Chaff—From £4 5s to £5 5s per ton. Bran and Pollard—£6 15s to £7 10s per ton. Flour—Local, £10; imported, £9 5s to £9 10s per ton. Oats—New Zealand, 3s 3d to 3s 6d per bushel. Maize—Feed, 5s per bushel. Wheat—4s 3d to 4s 6d. per bushel. Oilcake—£7 to £7 15s per ton. Field Peas—4s 6d to 5s per bushel.

Fruit and Vegetables.—Oranges—Local, from 8s to 12s per case. Lemons—Local, from 6s 6d to 9s per case. Mandarines—Local, worth 20s to 25s per case. Bananas—Have been sold from 2s 6d to 5s, 10s, 18s to 25s per case. Passion Fruit—Worth 10s to 12s per case. Apples—Worth from 14s to 25s per case. Cabbage—Worth from 3s 6d to 8s per cwt. Cauliflowers—Worth from 2s 6d to 16s per dozen. Carrots and Parsnips—1s 6d dozen bunches. Turnips—Swedes, worth from 7s to 9s per cwt.; white unsaleable. Pumpkins—Bugle or iron bark, 8s to 9s per cwt. Rhubarb—Worth from 1d to 4d per lb.

Salads and Herbs.—Lettuce—Worth 6d to 8d per dozen. Spring Onions—Worth 6d to 8d per dozen bunches. Beetroot—Worth 1s 6d per dozen bunches. Tomatoes—Worth 2s 6d to 4s 6d per case. Celery—Worth 1s to 2s per dozen heads. Cress—Worth 6d per dozen bunches. Thyme—Marjoram, sage, off stalk dry 9d per lb. Mint—Off stalk 6d per lb.

Poultry.—Fowls—Table, 5s to 6s 6d per pair; others from 4s to 5s per pair. Chickens—2s 6d to 3s 6d per pair. Ducks—7s to 9s 6d per pair. Geese—Worth 12s per pair. Turkeys—From 14s to 21s per pair.

Carcase Meat.—Pork—10lb to 70lb, 5½d to 6½d per lb.

Sundries.—Bonedust—£7 to £7 10s per ton. Phosphate—£5 per ton. Superphosphate—£6 10s per ton. Guano—£5 10s per ton. Coarse Bacon Salt—£3 per ton. New Cornsacks—7s 6d per dozen; second-hand, 4s 6d per dozen. New Bran Bags—4s 6d to 4s 9d per dozen; second-hand, 3s 6d per dozen.

THE CLIMATE OF WESTERN AUSTRALIA DURING JUNE, 1901.

The most noticeable feature of the month was the heavy rainfall experienced in the N.W. districts between the 13th and 20th. On the former date there was an ordinary winter "low" off the Leeuwin, and stormy weather was general throughout the State. This passed eastwards with heavy gales and very rough seas, especially when reaching South Australia, where phenomenal floods were reported, and the Austral was unable to land its mails and passengers until the storm subsided, but, as far as this State is concerned, the most remarkable feature was the effect which the passage of the storm appeared to have upon the weather on the N.W. coast. There may possibly have been no connection between the two, but for nearly a week heavy rains were experienced in this district, far heavier than ever before recorded in June.

The average pressure and temperature appear to have been on the whole fairly normal, and so was the rainfall in West central districts. In the extreme S.W. however, and throughout the Coolgardie and Murchison goldfields it was below the mean for previous years. Several frosty nights were experienced inland, and snow was reported in the early part of the month 40 miles inland from Israelite Bay.

The following table shows the mean and absolute minimum temperatures on the surface of the ground at a few places:—

	Mean.	Lowest.	Date.
Cue... ..	40·8	28·1	5
Coolgardie... ..	38·6	26·1	10
Southern Cross... ..	37·2	26·9	12
York... ..	38·6	—	—
Perth Observatory... ..	44·2	33·6	17
Katanning... ..	33·1	24·0	17
Bridgetown... ..	35·7	26·3	22
Karridale... ..	41·6	31·2	20

THE CLIMATE OF WESTERN AUSTRALIA DURING JUNE, 1901.

Locality.	Barometer (corrected and reduced to sea level).				Shade Temperature.				Average for Previous Years.				Rainfall.	
	Mean of		High- est.	Low- est.	June 1901.		Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever re- corded.	Lowest ever re- corded.	Points (100 to inch) in month.	Total points since Jan. 1.
	9 a.m. Prev.	3 p.m.			Mean Max.	Mean Min.									Mean of Month.
Wyndham	29.986	29.988	30.145	29.864	88.6	68.8	78.7	93.2	82.0	67.6	113.0	52.0	Nil	1371
Derby	29.992	30.007	30.126	29.863	84.7	63.6	74.2	92.0	53.2	85.6	99.0	47.0	25	1053
Broome	29.998	30.013	30.119	29.885	78.7	61.5	70.1	86.0	52.0	82.1	96.9	39.0	973	3165
Condon	30.131	30.040	30.230	—	75.2	51.4	63.3	92.2	42.0	77.5	94.0	39.2	205	2261
Cossack	30.065	30.031	30.197	29.893	75.0	57.8	66.4	80.2	49.4	75.6	95.0	44.9	72	729
Onslow	30.012	30.078	30.188	29.872	75.9	56.4	66.2	81.0	48.0	77.5	94.0	38.0	72	247
Carnarvon	30.079	30.042	30.273	29.833	73.0	53.7	63.4	81.7	42.5	77.9	90.0	36.0	130	436
Hamelin Pool	30.081	30.066	30.315	29.839	71.0	51.3	61.2	78.8	41.2	68.4	76.0	36.2	153	203
Geraldton	30.096	30.103	30.371	29.745	69.6	49.3	59.4	77.0	40.0	68.5	84.2	35.0	459	925
Hall's Creek	30.098	—	—	—	78.6	53.2	65.9	88.4	38.0	—	—	—	71	1541
Marble Bar	—	—	—	—	75.7	53.7	64.7	88.5	42.7	—	—	—	154	1356
Nullagine	30.086	—	30.247	29.843	72.6	47.3	60.0	83.0	32.8	—	—	—	30	1591
Peak Hill	30.122	—	30.321	29.819	66.2	46.8	56.5	73.2	39.2	—	—	—	41	599
Cue	30.130	30.095	30.385	29.844	68.5	45.4	57.0	75.8	36.4	63.5	47.1	34.0	70	387
Yalgoo	30.109	30.086	30.403	29.816	67.7	45.3	56.5	74.2	39.0	63.4	46.4	33.8	84	307
Lavellers	30.120	—	30.428	29.773	65.6	44.5	55.0	76.2	35.2	—	—	—	25	557
Laverton	—	—	30.488	30.729	64.1	41.1	52.6	72.2	29.4	—	—	—	62	519
Manzies	30.126	30.100	30.489	29.712	64.0	44.5	54.2	73.0	37.0	61.1	45.1	34.0	84	547
Kalgoorlie	30.098	30.086	30.516	29.675	62.6	44.7	53.6	72.4	35.4	60.4	45.6	34.0	84	425
Coolgardie	30.105	—	30.514	29.678	62.4	43.0	52.7	73.2	35.1	60.2	43.8	31.5	90	395
Southern Cross	30.106	30.067	30.523	29.676	62.3	41.8	52.0	74.8	31.2	61.1	42.9	28.0	143	370

The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

THE CLIMATE OF WESTERN AUSTRALIA DURING JUNE, 1901.—Continued.

Locality.	Barometer (corrected and reduced to sea level.)			Shade Temperature.				Average for Previous Years.				Rainfall.	
	Mean of 9 a.m. and 3 p.m.	Aver- age for Pre- vious years.	High- est.	Low- est.	June 1901.			Mean Max.	Mean Min.	Highest ever re- corded.	Lowest ever re- corded.	Points (100 to re- inch) in month.	Total Points in June.
					Mean of Month.	Highest of Max.	Lowest of Max.						
Northern ...	...	...	...	...	...	...	...	...	...	...	...	...	...
York ...	30.114	30.103	30.536	29.653	52.0	71.4	31.8	61.4	42.8	80.0	28.0	311	650
Guildford ...	...	...	...	...	54.4	72.0	30.2	—	—	—	—	346	691
Perth Gardens ...	30.103	30.100	30.510	29.624	54.4	72.0	30.2	64.7	47.1	81.0	31.2	511	1266
Perth Observatory ...	30.107	30.054	30.514	29.593	56.2	72.0	41.3	62.6	48.6	73.2	36.9	704	1664
Fremantle ...	30.076	30.081	30.470	29.598	51.1	70.0	44.2	63.4	50.4	82.0	38.0	717	1668
Rottnest ...	30.064	30.044	30.472	29.541	58.2	67.0	45.4	64.0	51.4	77.0	40.5	536	1326
Mandurah ...	...	...	...	...	...	...	...	...	...	...	...	456	1112
Wandering ...	...	...	...	...	...	...	...	...	...	...	...	565	1416
Collie ...	...	...	...	...	48.8	68.0	29.9	—	—	—	—	252	790
Bunbury ...	30.096	30.074	30.500	29.588	55.9	70.2	36.8	63.1	47.6	80.0	34.0	498	1508
Russellton ...	...	...	...	...	52.9	67.5	34.0	—	—	—	—	435	1318
Bridgetown ...	...	...	...	...	50.2	69.2	31.5	—	—	—	—	446	1322
Karridale ...	30.059	30.006	30.536	29.460	54.4	68.5	37.2	62.1	46.8	76.0	31.8	444	1395
Cape Leeuwin ...	30.002	29.965	30.511	29.355	57.2	68.0	46.2	62.0	52.8	70.2	46.8	712	206
Katanning ...	30.088	30.036	30.558	29.563	49.9	65.5	31.0	59.7	41.9	71.5	29.5	443	1557
Albany ...	30.054	30.064	30.547	29.466	53.4	68.0	35.8	59.6	47.2	79.0	34.0	201	823
Breaksea ...	30.059	—	30.569	29.445	50.0	67.0	45.8	59.9	51.0	71.0	43.0	535	1195
Esperance ...	30.022	30.094	30.407	29.516	54.6	70.4	35.6	62.8	46.4	77.0	33.0	385	859
Belladonia ...	...	...	...	...	51.8	75.0	29.8	—	—	—	—	841	1301
Eyre ...	30.011	—	30.477	29.595	54.7	76.7	29.0	—	—	—	—	12	293
...	...	...	...	...	...	...	...	...	...	...	...	30	385

The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

THE OBSERVATORY, PERTH, 5th July, 1901.

W. E. COOKE. Government Astronomer.

RAINFALL for May, 1901 (completed as far as possible),
and for June, 1901 (principally from Telegraphic Reports).

STATIONS.	MAY.		JUNE.		STATIONS.	MAY.		JUNE.	
	No. of points. 100 equals lin.	No. of wet days.	No. of points. 100 equals lin.	No. of wet days.		No. of points. 100 equals lin.	No. of wet days.	No. of points. 100 equals lin.	No. of wet days.
EAST KIMBERLEY:					N'TH-WEST—Cont.				
Wyndham ..	Nil	..	Nil	..	Tambrey ..	45	1	..	..
6-Mile ..	..	..	..	..	Millstream ..	58	1	..	..
Carlton ..	..	..	..	..	Mallina ..	..	..	..	..
Denham ..	..	..	..	..	Whim Creek ..	Nil	..	135	4
Rosewood Downs ..	..	..	..	..	Cooyapooya ..	Nil	..	..	..
Argyle Downs ..	..	..	..	..	Woodbroke ..	Nil	..	..	..
Lisadell ..	..	..	..	..	Croydon ..	Nil	..	..	..
Turkey Creek ..	Nil	..	16	2	Balla Balla ..	Nil	..	118	6
Ord River ..	..	..	..	..	Roebourne ..	Nil	..	113	7
Koojubrin ..	..	..	..	..	Cossack ..	Nil	..	72	..
Hall's Creek ..	Nil	..	71	..	Fortescue ..	5	1	72	6
Flora Valley ..	..	..	..	..	Mardie ..	Nil	..	..	..
Ruby Creek ..	..	..	..	..	Mt. Stewart ..	10	4	..	..
Denison Downs ..	..	..	..	..	Yarraloloa ..	..	..	..	..
					Chinginarra ..	Nil	..	..	..
WEST KIMBERLEY:					Peedamullah ..	..	..	..	..
Obagama ..	..	..	..	..	Onslow ..	47	2	72	5
Derby ..	Nil	..	25	..	Red Hill ..	111	3	..	..
Yeeda ..	Nil	..	..	..	Mt. Mortimer ..	15	2	..	..
Liveringa ..	Nil	..	..	..	Nanutarra ..	..	..	..	..
Mt. Anderson ..	..	..	..	..	Point Cloates ..	257	6	190	..
Leopold Downs ..	..	..	..	..	GASCOYNE:				
Fitzroy Crossing ..	Nil	..	238	4	Winning Pool ..	79	5	185	4
Quanbun ..	Nil	..	..	..	Towara ..	34	2	..	..
Nookanbah ..	..	..	..	..	Ullawarra ..	76	4	..	..
Broome ..	Nil	..	973	..	Woorkadjia ..	26	1	..	..
Thangoo ..	..	..	..	..	Bangemall ..	50	4	..	..
La Grange Bay ..	..	..	488	6	Yanyaeaddy ..	..	..	..	..
NORTH-WEST:					Williambury ..	72	5	..	..
Wallal ..	Nil	..	239	7	Carnarvon ..	154	5	130	..
Condon ..	Nil	..	205	6	Dirk Hartog Is. ..	135	10	416	..
DeGrey River ..	Nil	..	..	..	Mungarra ..	69	2	..	..
Port Hedland ..	Nil	..	61	8	Clifton Downs ..	74	3	..	..
Boodarie ..	Nil	..	..	..	Dairy Creek ..	10	1	..	..
Yule River ..	Nil	..	..	..	Errivilla ..	82	2	..	..
Warralong ..	Nil	..	..	..	Sharks Bay ..	54	7	131	5
Muccan ..	..	..	..	..	Kararang ..	195	10	..	..
Mulgié ..	..	..	..	..	Wooramel ..	117	5	45	4
Eel Creek ..	..	..	..	..	Hamelin Pool ..	34	7	153	7
Coongon ..	..	..	..	..	Byro ..	38	2	..	..
Warrawagine ..	Nil	..	..	..	Berringarra ..	2	1	..	..
Bamboo Creek ..	Nil	..	227	4	Mt Gould ..	15	1	..	..
Marble Bar ..	Nil	..	154	8	Peak Hill ..	109	4	41	..
Warrawoona ..	Nil	..	81	8	Horseshoe ..	127	4	..	..
Corunna Downs ..	..	..	..	..	Abbotts ..	65	3	32	4
Nullagine ..	Nil	..	30	2	Mileura ..	Nil	..	..	..
Yandicoogina ..	Nil	..	86	7	Manfred ..	28	2	..	..
Tambourah ..	Nil	..	..	..	Meelya ..	98	4	..	..
Mulga Downs ..	Nil	..	..	..	Woogorong ..	34	2	..	..
Woodstock ..	Nil	..	..	..	Boolardy ..	..	..	..	..

RAINFALL.—Continued.

STATIONS	MAY.		JUNE.		STATIONS.	MAY.		JUNE.	
	No. of points. 100 equals lin.	No. of wet days.	No. of points. 100 equals lin.	No. of wet days.		No. of points. 100 equals lin.	No. of wet days.	No. of points. 100 equals lin.	No. of wet days.
GASCOYNE—Cont.					S. W. Div.—Cont.				
Billabolong ..	73	3	191	..	Belvoir ..	602	13	476	15
Wooleane ..	35	3	..	..	Guildford ..	523	15	511	16
Murgoo ..	58	3	..	..	Kallyamba ..	707	16	601	18
Meka ..	55	4	..	..	Can'ing W'orks ..	755	11	745	15
Mt. Wittenoom ..	55	4	..	..	Perth Gardens ..	751	16	704	19
Nannine ..	33	2	48	3	„ Observatory ..	733	16	717	19
Star of the East ..	58	4	37	4	Subiaco ..	745	16	680	17
Tuckanarra ..	5	1	29	3	Claremont ..	602	13	703	16
Coodardy ..	41	3	..	..	„ Richardson ..	597	11	..	..
Cue ..	26	2	70	7	Armadale ..	..	..	424	13
Day Dawn ..	27	2	52	6	Fremantle ..	577	15	536	17
Lake Austin ..	45	4	40	4	Rottnest ..	516	14	456	..
Lennonville ..	65	4	46	4	Rockingham ..	564	13	526	14
Mt. Magnet ..	55	3	57	7	Canning River ..	615	13	..	..
Challa ..	50	3	44	4	Jarrahdale ..	770	12	642	16
Youeragabbie ..	58	2	..	..	Mandurah ..	665	12	565	16
Murru ..	52	2	..	..	Pinjarrah ..	739	14	384	14
Yalgoo ..	76	5	84	..	Harvey ..	663	17	477	18
Gullewa ..	158	8	172	7	SOUTH-WEST, CENTRAL PART (IN- LAND):				
SOUTH-WEST DIVISION (N'N PART):					Momberkine ..	278	4	267	10
Murchison House ..	265	10	..	..	Culham ..	296	9	303	11
Mt. View ..	192	10	276	14	Newcastle ..	331	11	393	13
Yuin ..	104	3	..	..	Eumalga ..	306	11	326	11
Northampton ..	366	9	381	12	Northam ..	227	10	311	13
Mt. Erin ..	271	11	..	..	Grass Valley ..	232	5	..	..
Oakabella ..	208	6	173	4	Meckering ..	285	7	269	10
Narra Tarra ..	318	7	..	..	Cunderdin ..	..	..	256	10
Tibradden ..	291	10	520	7	Doongin ..	210	5	..	..
Sand Springs ..	307	10	..	..	Whitehaven ..	193	7	..	..
Mullewa ..	242	8	258	7	Sunset Hills ..	253	12	..	..
Bootenal ..	456	10	..	..	Cobham ..	219	12	339	15
Geraldton ..	376	10	459	..	York ..	187	12	346	..
Greenough ..	499	12	432	13	Beverley ..	224	12	234	12
Dongara ..	504	10	479	10	Barrington ..	216	11	342	15
Dongara (Pearse) ..	519	11	490	12	Sunning Hill ..	282	8	..	..
Strawberry ..	322	10	..	..	Wandering ..	361	13	252	15
Minginew ..	440	13	337	17	Pingelly ..	175	9	202	8
Rothsay ..	503	9	..	..	Marradong ..	440	11	340	13
Field's Find ..	151	7	..	..	Bannister ..	445	15	281	16
Carhamah ..	340	10	255	14	Narrogin ..	217	13	212	12
Watheroo ..	363	11	264	13	Wickepin ..	260	9	..	..
Dandaragan ..	521	11	446	14	SOUTH-WEST DIVISION (S'N PART):				
Moora ..	306	9	325	15	Bunbury ..	697	16	435	..
Yatheroo ..	440	10	530	15	Collie ..	..	..	498	16
Walebing ..	385	12	361	16	S.A. Settlement ..	647	13	478	14
New Norcia ..	387	11	382	15	Glen Mervyn ..	646	12	370	15
SOUTH-WEST DIVISION, CENTRAL (COASTAL):					Dardanup ..	667	16	..	..
Gingin ..	721	14	542	15	Donnybrook ..	811	15	393	16
Mundaring ..	664	13	..	..	Boyanup ..	870	17	422	18

RAINFALL.—Continued.

STATIONS.	MAY.		JUNE.		STATIONS.	MAY.		JUNE.	
	No. of points. 100 equals lin.	No. of wet days.	No. of points. 100 equals lin.	No. wet days.		No. of points. 100 equals lin.	No. of wet days.	No. of points. 100 equals lin.	No. of wet days.
SOUTH-WEST—Cont.					EASTERN DIV.—Con				
Busselton ..	446	15	446	21	Mt. Morgans ..	63	4	74	5
Quindalup ..	499	14	503	10	Laverton ..	38	2	62	4
Margaret River ..	919	16	..	..	Murrin Murrin ..	60	6	89	8
Lower Blackwood ..	615	12	505	13	The Granites ..	40	1	55	2
Karridale ..	852	21	712	12	Tampa ..	60	3	..	..
Augusta ..	655	18	483	18	Niagara ..	44	3	70	3
Cape Leeuwin ..	724	23	453	25	Yerilla ..	45	4	33	4
Biddellia ..	606	10	..	..	Menzies ..	80	5	84	5
The Warren ..	540	15	..	..	Waverley ..	..	..	78	2
Lake Muir ..	284	19	..	..	Goongarrie ..	50	6	79	4
Mordalup ..	216	18	..	..	Mulwarrie ..	..	..	104	4
Deeside ..	288	14	..	..	Kurawa ..	46	5	94	6
Riverside ..	379	18	..	..	Dixie Gold Mine ..	37	4	107	7
Balbarup ..	400	16	404	17	Kurnalpi ..	58	4	49	5
Wilgarup ..	479	17	461	15	Bulong ..	49	5	55	6
Mandalup ..	668	15	389	13	Kanowna ..	39	4	57	6
Bridgetown ..	645	17	444	17	Kalgoorlie ..	59	5	84	6
Greenbushes ..	659	9	425	12	Coolgardie ..	43	4	90	7
Williams ..	286	13	223	11	Burbanks ..	38	3	103	8
Arthur ..	257	13	203	..	Woolubar ..	35	4	..	..
Darkan ..	368	12	..	..	Widgiemooltha ..	30	5	105	6
Wagin ..	203	11	174	14	50-Mile Tank ..	21	3	..	..
Glencove ..	253	14	..	..	Norseman ..	29	5	175	6
Dyliabing ..	222	9	..	..	Bulla Bulling ..	40	3	191	..
Katanning ..	362	12	261	..	Woolgangie ..	..	..	200	5
Kojonup ..	362	9	267	12	Boorabbin ..	52	5	147	10
Broomehill ..	242	13	209	16	Karalee ..	88	3	..	..
Sunnyside ..	302	13	220	14	Yellowdine ..	..	..	..	..
Woodyarrup ..	321	16	..	..	Southern Cross ..	133	7	143	10
Cranbrook ..	442	6	254	13	Mount Jackson ..	130	5	121	7
Blackwattle ..	216	10	..	..	Burracoppin ..	185	5	141	8
Mt. Barker ..	193	13	351	16	Kellerberrin ..	186	7	233	14
Kendenup ..	202	13	371	16	Mangowine ..	225	9	223	16
St. Werburgh's ..	183	20	..	..	Waltoning ..	128	5	..	..
Forest Hill ..	271	20	..	..	EUCLA DIVISION :				
Denmark ..	308	14	..	..	Ravensthorpe ..	..	..	287	11
Albany ..	223	14	535	18	Coconarup ..	193	11	..	..
Point King ..	238	11	522	17	Hopetoun ..	205	12	318	16
Breaksea ..	172	12	385	19	Fanny's Cove ..	156	15	..	..
Cape Riche ..	106	6	304	12	Park Farm ..	93	10	..	..
Pallinup ..	289	14	175	12	Esperance ..	150	14	841	..
Bremer Bay ..	302	11	523	14	Gibson's Soak ..	112	6	..	..
Jarramongup ..	..	..	..	..	30-Mile Condenser ..	65	7	..	..
EASTERN DIVISION :					Swan Lagoon ..	139	13	..	..
Lake Way ..	49	5	20	4	Lynburn ..	..	..	..	..
Mt. Sir Samuel ..	57	5	8	3	Grass Patch ..	98	11	..	..
Lawlers ..	59	4	25	6	Israelite Bay ..	68	6	123	10
Diorite King ..	85	4	..	..	Frazer Range ..	35	2	..	..
Sturt Meadows ..	..	..	..	..	Balladonia ..	42	3	12	3
Mt. Leonora ..	76	4	20	4	Eyre ..	81	..	39	..
Mt. Malcolm ..	61	2	43	..	Eucla ..	114	8	70	8

The Observatory, Perth July 3 1904

W. E. COOKE, Govt. Astronomer.

RETURN OF FRUIT IMPORTED INTO WESTERN AUSTRALIA DURING JUNE, 1901.

NAME of Port	No. of Ships.	No. of Consign- ments Inspected.	Total No. of Cases.	No. of Cases Passed.	No. of Cases Prohibited.	No. of Cases Destroyed.	No. of Cases in Quarantine.	No. of Cases Dipped.	No. of Cases of															
									Apricots.	Bananas.	Cherries.	Gooseberries.	Grapes.	Lemons.	Nectarines.	Oranges.	Passion Fruit.	Peaches.	Plums.	Rhubarb.	Strawberries.	Pomoloes.	Pines.	All other fruits.
FREMANTLE	10	14	2917	2917	..	..	..	2917	..	1557	..	..	..	119	..	430	311	..	..	..	..	..	..	..
ALBANY	5	5	120	113	7	..	..	120	..	29	..	..	..	6	..	72	..	..	..	..	..	..	..	..
GERALDTON .. ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
HAMBLETON	1	1	1	1	..	..	..	1	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
BRUSELTON .. ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
BONBURY .. ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
ESPERANCE .. ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
TOTAL	16	20	2438	2431	7	..	..	2438	..	1586	..	..	..	126	..	502	311	..	..	..	..	..	..	..

DEPARTMENT OF AGRICULTURE,

4th July, 1901.

RETURN OF FRUIT TREES AND PLANTS IMPORTED INTO WESTERN AUSTRALIA DURING JUNE, 1901.

NAME OF PORT.	No. of Ships.	No. of Consign- ments of Trees or Plants.	Total No. of Trees or Plants in such Consignments.	No. of Consign- ments Passed.	Total No. of Trees or Plants in such Consignments.	No of Consign- ments of Trees or Plants Prohibited.	Total No. of Trees or Plants in such Consignments.	No. of Packages Dipped.	No. of Trees.													All Other Trees			
									Ornamental & Pot Plants.	Almonds.	Apples.	Apricots.	Cherries.	Figs.	Lemons.	Limes.	Mulberries.	Oranges.	Peaches.	Pears.	Plums.		Small Fruits.	Vine Cuttings.	
FREMANTLE	40	56371	40	56371	..	..	149	2769 153	93750	1524 313	450	81	425	425	425	425	425	425	425	425	425	425	425	1687
ALBANY	4	2640	7	2640	..	..	11	50	2980	..	..	..	..	..	..	..	10	..	..	..	200	..	..	..
GERALDTON
HAMELIN
BUSSELTON
BUNBURY
ESPERANCE
TOTAL ..	17	47	50011	47	50011	160	2819 153	35130	1524 313	450	81	425	425	425	425	425	425	425	425	425	425	425	1687

DEPARTMENT OF AGRICULTURE,

4th July, 1901.



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NOTES.

WHEATEN HAY FOR HORSES.—The Agricultural Department of Victoria is at present experiencing some difficulty in connection with the exportation of hay to South Africa, to supply the wants of the war authorities there. Mr. Morrissey, Minister for Agriculture, has been in communication with the War Office in regard to the matter. Imperial officers decline to accept wheaten hay, and as the supply of oaten hay in Victoria is about exhausted, there is some difficulty in providing the quantity required. The War Office asserts that wheaten hay is only fit to be used as fodder for mules and oxen. Mr. Morrissey is of opinion that they are labouring under a misapprehension, as he is convinced that even better results can be obtained in South Africa from wheaten hay than oaten hay. He goes so far as to say that the opinion of wheaten hay formed by the war authorities is absurd. It is the intention of Mr. Morrissey to again put himself in communication with the War Office in regard to the matter. He feels so strongly upon it that he thinks the Department could guarantee good results from the use of wheaten hay.

ANGORA GOATS.—The reasons for the great hold that the Angora goat has on American pastoralists are effectively set forth in the following extracts from the report of the Kansas Agricultural Society. After commenting on the almost omnivorous tastes of the Angora goat, the article goes on:—"They are a profitable animal in the feed lot; give them like conditions and the same amount of grain, they will take on flesh very rapidly, and fatten in one-fourth less time than sheep. They respond very quickly to good care. At the final test of all domestic animals—the butcher's block—the Angora goat is not found wanting. Their flesh in summer, when browsing, has a very delightful flavor, between venison and mutton, which gives the name 'venison' to their meat. Being a browser, like the almost extinct deer, it is right that it should assume the name of its meat. In winter, when fattened on grain, it loses that flavor, but acquires a mutton flavor. It has none of that 'woolly' taste of mutton, which is so objectionable to many people. Thousands of them are killed in all our packing-houses, and sold as 'well-dressed mutton.' Only an expert can tell the difference, as their carcasses appear the same when dressed and hanging in the meat market. They will dress out a larger per cent. of meat than sheep; hence it is that they are much more valuable. Its meat is more juicy than mutton and a finer flavor. Then you know what you are eating is absolutely healthy, and free from disease. Thus we find a new and profitable animal for the farm, which will thrive and fatten on that which curses the land, and it will take its place among the leading industries of the country."

MONEY IN THE COMPOST HEAP.—One will be surprised if he will gather all refuse round about the buildings and place it in a bin in a dry place. I will name some of the ingredients of my compost: Hen manure, ashes, sweepings of all kinds, even the house sweepings are saved and box emptied in the compost bin, yard cleanings, if not too coarse, very fine stable cleanings, offal of sanitary regulations, and any stuff from around the buildings which may contain some plant-food. It matters not how small the amounts may be, it will be worth dollars in a year's time. A bin 4 x 4 x 10 feet long will hold 2½ or 3 tons. It needs no bottom of boards, and any old boards will do for the sides. It is necessary to apply water if the heap becomes too dry, and if an odour escapes apply air-slaked lime. It would be well to use air-slaked lime occasionally, which would liberate some of the unavailable parts of plant-food. I use my compost for corn. By planting time I have about 2½ tons of fertilizer, worth from £3 to £4 per ton. Neglect of this resource would mean a loss of about £7 a year. In what way can we obtain £7 worth of fertilizer more easily than by simply noticing these little piles of refuse and gathering them together?—G. W. HARLACHER, in *American Agriculturist*.

ARE BEES A NUISANCE.—In the March issue of the JOURNAL, on page 205, appeared an article under the heading "Are Bees a Nuisance." The case of *Utter v. Utter*, of New York, U.S.A., was given, when a man sued for alleged damage to his peach trees, by his brother's bees. The following additional particulars from Professor Frank Benton's evidence, which we clip from an American exchange, should prove of interest:—"The case of *Utter v. Utter* at Goshen, New York, exercised the attention of Bee-keepers in the United States for a while. One fruit-grower sued his brother, a bee-keeper, for damages done to his peaches by the latter's bees. The National Bee-keepers' Association took up the cudgels and supported the defendant. The case was a hard-fought one, with plenty of legal counsel and witnesses on either side. The star witness for the defendant, however, was Professor Frank Benton, an assistant entomologist of the United States Department of Agriculture. He had spent thirty years studying bees, and for that purpose spent four years in Austria, four years in Germany, and several in Eastern countries, in pursuit of bee knowledge. He said that the tongue of the bee was soft and pliable, and could not puncture a peach. The inner tongue of the bee is spoon-shaped, and covered with hair. It cannot become rigid. It laps its food, which is called Nectar, and is fond of rotten peaches. Its feelers are soft, and cannot pierce any substance that offers the least resistance. They are supposedly the organs of touch and smell by which bees recognise each other by the odour of the body. Sometimes they will meet and wind their feelers about each other. This is their method of shaking hands. The Jury decided that honey bees do not injure peaches—as that was the point at issue, but practically their decision means not only peaches but all fruit."

FRUIT FROM OLD MELON SEED.—A writer in the *Gardeners' Chronicle* describes the experience in raising melons from old seed as giving better results than from young seed. His observations, which entirely confirm that of previous observers, are as follow:—“In a small melon-house I noticed two plants, which were very vigorous, and survived the first crop of female flowers, than usual. In the same house was a batch of young plants, with good male blossoms. I fertilized the females of the older plant with the pollen from the younger. The crop of fruit was nearly double that of the first. The fruits were large and of excellent quality throughout. A year or two afterwards, having to supply ripe melons in May and onwards, and having noticed that plants from old seed produced a less succulent growth than did those from young seed, for four years I raised my plants from old seed, always growing a few plants from the new seed. I then fertilized the female flowers of the older plants with the pollen of the younger, which plants were invariably the more robust. The resulting fruits were more reliable in good quality, and though the female flowers had been small, the fruits were large, weighing from 3lb. to 7lb.” Mr. Henslow has given very similar experiences on the Continent in his “Origin of Floral Structures,” p. 247. M. F. Cazzuola, in addition, found that melon-plants raised from fresh seeds bore a larger proportion of male than female flowers; while older seed bore more male than female flowers.

MANGEL WURZELS.—It is a pity to see crops so prolific as Mangel Wurzels neglected by dairy farmers who have abundance of easily-saved farmyard manure. Sown in August and September the crop becomes available at a time when the stock can best appreciate this wholesome juicy fodder. Mangels do best in a soil that has been well and deeply worked and rather heavily manured for some previous crop. If such an area is not available, the land should be made ready during July at latest, and dressed with about fifteen well packed loads of yard manure per acre, spread over the ground after the first ploughing and turned under in cross ploughing. A few days before sowing, the soil should be worked down fine and fairly level with the harrow. The seed should be sown in drills sufficiently far apart to permit of the passage of a Planet Junior horse-hoe, as in the case of dry weather in spring it will be necessary to keep the soil well stirred as close to the plants as possible. From 3 to 4 lb. of seed will be required per acre, and germination of it may be hastened by soaking it previous to use in water for 24 hours. When the plants are just big enough to enable one to determine the thifty ones and the runts, they should be thinned out to about a foot to 18 inches apart. All weeds in the rows of plants which thus escape destruction by the horse-hoe must be removed, and in attending to these the portions of soil between the plants in the row can be scuffed with a hand-hoe occasionally, so that the plants will be encouraged to root uniformly.

—N.S.W. *Agricultural Gazette*.

CULTIVATION OF SWEET POTATOES.

BY PERCY G. WICKEN.

The Sweet Potato (*Batatus edulis*) is a native of tropical South America. It was first introduced into Europe from Brazil, and has since proved to be well adapted for cultivation in the Australian States. It is a robust and hardy growing plant, and, given suitable soil and locality, is a prolific bearer, it is valuable both as food for man and cattle, and should take a much higher position in our rotation of crops than it has done in the past.

SOIL AND LOCATION.

A soil free from stones seems essential, and a sandy loam is the best for this crop. A stiff clayey soil causes the tubers to split when the weather becomes dry and hot.

The ground requires to be well drained, and in a district that will be free from frost during the growing months, viz.: October to April. In many localities the cuttings cannot be planted out until November, owing to the weather not being sufficiently warm to start the cuttings in time to plant out earlier.

SEED BED.

Many settlers fail in growing this crop from want of knowledge as to how to produce the cuttings to plant out. The following is the method I have found most successful. Mark out a piece of land, in a sandy soil if possible, sufficiently large to allow the potatoes to be spread over. An area of 6 ft. by 6 ft. will be sufficient for 2 cwt. of potatoes. Then remove the top four inches of soil from the space and place on each side of the bed, now take your potatoes and lay on the bottom of the bed, taking care that they do not touch each other, and throwing out any that have started to go bad, then put back the soil previously removed on the top of the potatoes, levelling the bed and lightly packing down with the back of the spade. If the ground is very dry give a good watering. In a few weeks' time according to the weather, the young shoots will appear above ground, when about three inches high they are ready for planting out. Start in one corner of the bed and remove the soil and lift out the potato, and it will be found to be covered with young shoots, some potatoes having a few dozen, others up to a hundred shoots, according to the size of the potato. These shoots are now broken off from the tuber and are ready for planting out. The tubers can be replaced in the ground the same as before, and in a very short time a fresh crop of shoots will appear which can be removed in the same way, and if not too late in the season, a third crop may also be obtained.

In localities where the season is late the following method may be adopted. Make a frame of some old boards, sink about 1 ft. in the ground and about 1 ft. above it, throw out the first foot of soil and then place in the space about 18 inches of good stable manure and tread well down and cover with about 4 inches of soil,

leave for a couple of days, and then lay the potatoes on top of the soil the same as in the other seed bed and cover with 3 or 4 inches of fine soil. The shoots will come very quickly. If there is still any danger of frost, the beds must be covered at night with a light brush or calico screen, and the cuttings must not be planted in the field until all danger of frost is over. If the shoots appear in the bed in an irregular manner, it is better to pull them out by hand when required, than to disturb the whole tuber, which will be covered with small sprouts. The shoots will come away easily, and if pulled carefully very few will be broken. The shoots should be kept in a box or wrapped up in a wet sack while being taken from the seed-bed to the field, and should not be left laying about exposed to the sun.

MANURE.

The Sweet Potato feeds largely on Nitrogen and Potash with a smaller amount of Phosphoric Acid, and a manure containing these ingredients should be used. A mixture composed as follows:—

3 cwt. Nitrate of Soda

4 cwt. Kainit

3 cwt. Superphosphate

per half ton would probably give good results. It should be applied in the ridges at the rate of 3 or 4 cwt. per acre, at the time of ridging up the ground preparatory to transplanting the cuttings.

PREPARATION OF LAND.

The land requires to be well and deeply worked, and the crop responds well to deep cultivation; being a summer crop it requires to obtain its moisture during the dry weather and for this purpose sends its roots deep down into the soil. For this reason subsoiling is of great advantage to the plant as it is to most other plants. After the soil is well broken up it requires to be brought to a fine tilth by discing, harrowing, etc. As soon as the plants are nearly ready for transplanting the land should be drilled out into ridges, 3 feet 6 inches apart, by a drill plough, or a corn hilling disc is very useful for this purpose. The system I carried out for planting was as follows:—A small hill was made by running the corn-hilling disc along the rows with the discs set at a slight angle, the manure was then spread along this drill by hand, the machine again run over the hill with the discs set at a greater angle which hilled it up to a good height and covered the manure, and the land is then ready for planting the cuttings or slips.

PLANTING.

The slips should be planted in rows about 18 inches apart, and with the rows 3 feet 6 inches apart it will take 8,556 to the acre. If the rows are 4 feet apart 6,136 to the acre. The best method for planting is for one man to go along the row with a marker and mark out where the slip is to go and to make a hole in the ground, the planter following and putting the slip in the hole previously made, care being taken to press the earth well round

the slip. If planted on a dull day and the ground is fairly moist the percentage of misses will be very small. Any slips that fail to take root can be replaced later on. Later in the season if it is desirable to put out a larger area, or a large number of misses require to be replaced, slips can be cut from any of the growing vines and planted out in exactly the same manner as those taken from the seed bed as previously described. From observations made by the writer it does not appear to have any effect on the crop whether the slips are taken from large or small tubers, so long as they are healthy and vigorous. It would therefore be more profitable to use the smaller size potatoes for this purpose, which are not so ready of sale as the larger ones.

CULTIVATION.

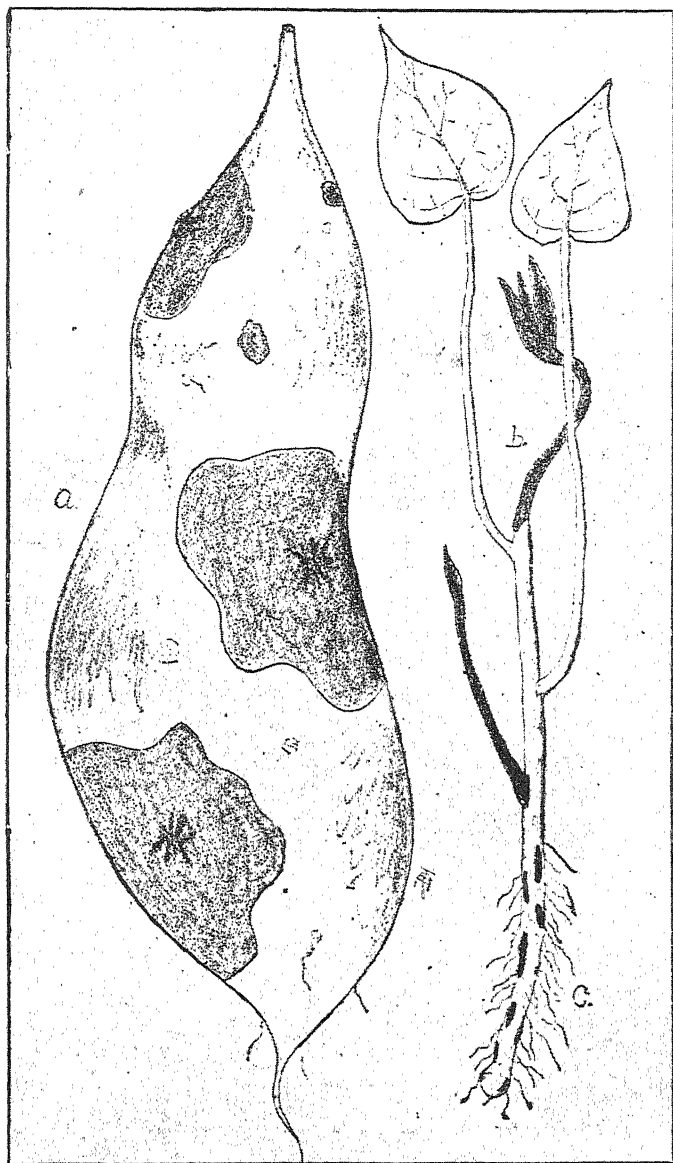
When the young plants are once established very little more requires to be done, except to run the Planet Junr. cultivator between the rows at frequent intervals, so as to keep the ground free from weeds and well stirred. If there are many weeds come up, it will be advisable to give the hills a good hoeing to prevent the weeds from growing and depriving the potatoes of their food and moisture. In running the cultivator between the hills care must be taken not to set the implement too wide so as to tear down the side of the hills and expose the young roots to the sun.

HARVESTING.

This operation must be performed by hand, as the tubers grow to a large size, and if dug by a plough large numbers are cut to pieces, and otherwise damaged. They should be dug during dry weather and as soon as the tubers have reached maturity and before they have time to make a second growth. The maturity of the sweet potato may be ascertained by breaking it. If the sap oozes freely it is of course immature, if little sap exudes it is nearly mature. Experience will soon be gained in this matter. As a rule the tubers are ready to dig about the end of March or the beginning of April. Care must be taken in digging and handling not to bruise the potatoes, as a small bruise when freshly dug is likely to cause the potato to rot. It is also beneficial to leave the potato in the sun for a short time after being dug before bagging or putting into a shed, and when bagging, all damaged, cut or bruised potatoes must be excluded. These damaged potatoes will only keep for a short time, and can be used on the farm for feeding pigs or other stock.

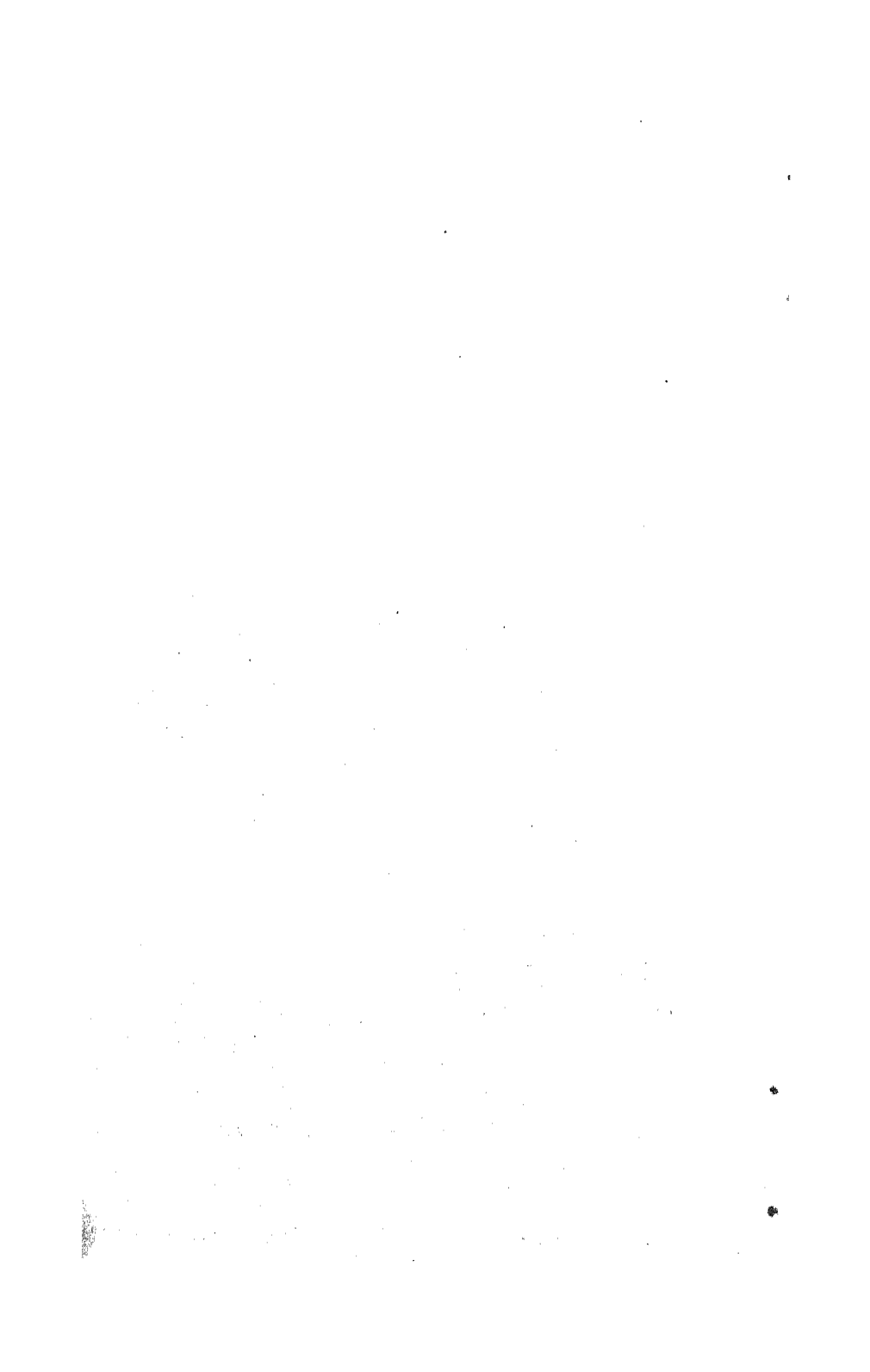
PRESERVATION.

One of the most difficult points about Sweet Potato growing is difficulty of keeping them so as to market at times of the year when they will fetch a good price, and also during the winter months so as to have a supply for the seed beds in the spring. The best way on a large scale is the method of "hilling or banking." This should be carried out under a shed or open roof so that the bank is not exposed to the weather. The best method to proceed is—lay on the



BLACK ROT.

a, diseased tuber; b, tip of diseased sprout; c, base of diseased sprout. (After Halsted).
(See page 81.)



ground, which must be dry, a good layer of straw, on top of this pack the potatoes in the form of a mound and cover the whole heap with a quantity of straw, and then put sufficient earth on top to cover the whole. In many instances where large stacks are built a zinc pipe perforated with 1 inch holes is placed through the centre of the stack, which allows all surplus moisture to escape while the potatoes are going through the sweating process. Another method which is only applicable on a smaller scale, but which I have always found very successful, is to obtain a number of old empty cement barrels, which can generally be picked up very cheap, place in the bottom of the barrel a layer of dry sand about 3 inches deep, then a layer of potatoes, then another layer of sand and so on until full, placing about 4 inches of sand on top of the barrel, this will keep the tubers quite sound all through the winter, and only one barrel need be opened at a time as required for use.

VARIETIES.

There are a large number of varieties of sweet potatoes. At the Georgia Experimental Station, U.S.A., thirty-four varieties were grown last season and reported on, the heaviest yield being the White St. Domingo. In the Australian States, however, only two varieties are at the present time obtainable, and they are generally known as the White Sweet Potato and the Red Sweet Potato. Both are good varieties and grow and yield well, the white will grow in cooler districts than the red.

DISEASES.

The Sweet Potato is attacked by several fungus diseases. The most important of these is the Black Rot Fungus *Ceratocystis Fimbriata*. The accompanying illustrations show a tuber attacked by this disease. It attacks the plant at any time of its existence even after being stored. The black spot is at first very small, gradually increasing in size until the whole tuber is destroyed. Owing to the nature of this disease, it is important that every precaution should be used to prevent it obtaining a footing. For this reason no diseased tubers should be used in obtaining shoots, young plants should be selected with great caution and diseased or suspicious tubers destroyed. Should any signs of the disease appear the plant should be immediately sprayed with Bordeaux mixture, which will prevent the development of the spores. All diseased plants should be burned, so that the spores of the disease do not remain in the soil. Do not plant in the same ground as a previous crop has been in, but carry out a system of rotation of crops and thereby prevent the spread of disease.

There were 38 fresh outbreaks of sheep scab in Great Britain during the month of May. These occurred in fifteen English counties, five Welsh counties, and two Scotch counties. In the same month last year the number of fresh outbreaks was 57. The administrative counties in which sheep scab existed during the month numbered 33 in England, 11 in Wales, and 6 in Scotland.

THE INSECTIVOROUS BIRDS OF WESTERN AUSTRALIA.

BY ROBERT HALL.

SCRUB-WRENS, GROUND-WRENS AND FIELD-WRENS.

The difficulty of distinguishing birds while in their variety of natural haunts is as noticeable in this continent as in that of Europe. There the names of Willow-Wren, Wood-Wren, Jenny-Wren and others are as troublesome to follow as many of the common names attached to ours. Yet in a general way there is a basis upon which to work for field identification. In our first article on Wrens a whole genus was referred to as *Maluri*. These can always be distinguished by their very conspicuous colours. The pages immediately following spoke of Emu and Grass-Wrens, and with the first of these there cannot be any trouble in recognition, as it is distinct from every other. This is because of its peculiar tail. The question of how to know Grass, Scrub, Ground and Field-Wrens upon first sight is not so easily settled. As a rule the Scrub-Wrens (*Sericornis*) are compactly formed and active birds that keep to dense vegetation, bordering water courses. The Ground-Wren is remarkable for its strong, clumsy feet and powerful rounded wings, both of which are necessary to the life of a ground bird. The Grass and Field-Wrens are distinguishable by their plumage characters rather than by any others. It would be a strange field that never grew grass.

The bird known to us as Jenny-Wren is, I believe, properly called a Chat. The first is merely a term of endearment. While there is a fable that the Wren is the "king" of birds, we have living in our midst a bird called *Geobasileus*, i.e., King of the Earth. This has been described under the title *Acanthiza chrysorrhoa*. The fable referred to speaks of a gathering of birds, so that a king over them might be chosen. To the bird who mounted highest the lot should fall. The eagle seemed to accomplish this, but a loud burst of song was heard. It came from the Wren, who had perched unseen upon the eagle's back, and at the critical moment had risen from the tired eagle and gone higher.

SPOTTED SCRUB-WREN (Spotted Sericornis).

Sericornis maculata, Gld. (*Ser-i-kôr'nis mak-u-la'ta*).

Serikos, silken; *ornis*, bird; *maculatus*, spotted.

Sericornis maculatus, Gould, "Birds of Australia," fol. vol. iii., pl. 51. "Key to the Birds of Australia," Hall, p. 26 (1899).

GEOGRAPHICAL DISTRIBUTION.—AREAS 9, 7, 6, 4.

KEY TO THE SPECIES.—Upper surface sombre; plumage silky; tail quite even, with a dark subterminal band, and white edging to tips of outer feathers; inner secondaries not edged white; base of forehead brown, like head; throat and chest very thickly spotted with blackish; under tail coverts yellowish, with concealed darker centres; tarsus plain.

Of the two species of *Sericornis* in our State one has a red throat. This is so far as the male is concerned, as the female's throat is whitish. Although adhering to a law of nature that the male sex be more conspicuously marked than the female, it is the only species in this genus of eleven that is strikingly different in their sexes. I refer to *S. brunnea*, Gld., the Red Throat. The call and note of the present species are clear, sharp, and decisive,



SPOTTED SCRUB WREN.

and the activity it displays leads it quickly from place to place, principally under cover. I have collected it at and between Albany and Geraldton. It seems a much quieter bird in the hot parts, but in the humid southern lands it revels.

During a limited stay at Denmark, by the courtesy of the Messrs. Miller Bros. I spent some time observing the nesting habits of this species. Outlined observations proved to be much the same as those of the white-browed species of South Australia. Because of the great need of knowledge of such natural histories, I supply the *modus operandi* of the nest building of a *Sericornis* (*S. frontalis*), as noted by Mr. Geo. Graham and the writer.

Before any signs of a nest was shown, a *Sericornis* placed a few grasses together in a thick-leaved bush, and continued to increase the mass for thirty minutes. Then it discontinued, and uttered a number of grating notes to make up for lost vocal time, and appealed to its mate—who had been hopping about near branches watching the operation—for a recognition of its work. This was at 11 a.m., when it adjourned work till 6 a.m. the following morning. Then one hour's work was given to the nest. During the whole of the time a series of peculiar grating calls was given, and nothing more was done till the same hour of the third morning (18th September). The roomy cell of homogenous plant matter then received the addition of an inner wall of another vegetable material, mainly old withered leaves. The bird now made an alteration in the time-table, and during the fourth, fifth, and sixth mornings it labored from about an hour before noon to an hour after, working leisurely throughout the time till the lining was completed. On the seventh day the first egg was laid; colour, brownish-purple spots and short streaks on a ground of lighter similar shades. The second egg was deposited on the ninth day of the month, and the third egg on the eleventh. On the fourteenth the bird had well set itself to the task of incubation.

In regular visits to four nests the eggs were found to be laid each forenoon early. The young birds hatched out on the twenty-third day from the time of the laying of the third egg, and the young were able to fly on the fifteenth day from the breaking of the shell. The family immediately begins a nomadic life, and the locality of the nest is left to other birds before the morning of the following day.

During the time of incubation the sitting bird leaves the nest to feed at early morning and evening, and at night returns with a small feather or some downy plumage, so that gradually the internal layer of its house is completed to its satisfaction. In six nests observed in that district two were lined with the fur of rabbits, the others with feathers. All were inclined, with the entrance protected from above, and faced the north-east, which is the fine quarter of that period of the year. It was noticeable that the intelligence of the birds led them to build the external portion of their dome nest during rain, or in the early morning, when the wiry grasses were pliable, and the wet-softened material could be the more easily adjusted to the required shape, while the inner layer was constructed at mid-day, when the material was dryer.

Nest.—Oval; side entrance; made of grasses and lined with feathers, etc. It is placed in low, rank vegetation, and always well hidden.

Eggs.—Three or four to a clutch; deep fleshy-white, with spots and streaks of reddish-brown, particularly round the broader end. Length, 0.75 inch; breadth, 0.6 inch.

RED THROAT.

Sericornis brunnea, Gld. (*Ser-i-kór'nīs brö 'ne-ä*).

Serikos, silken; *ornis*, bird; *brunus*, brown.

Pyrrholaemus brunneus, Gould, "Birds of Australia," fol. vol. iii., pl. 68. "Key to the Birds of Australia." Hall, p. 26 (1899).

GEOGRAPHICAL DISTRIBUTION.—Areas 9, 7, 6.

KEY TO THE SPECIES.—Upper surface sombre and silky; male has rufous throat, female a whitish one; tail feathers broadly tipped with white, with no distinct subterminal band, and quite even; tarsus plain; iris reddish-brown with a yellowish-white ring.

The Red-throat is one of the denizens of the dry timber, and a fairly common bird along the borders of the great central area. Specimens have been sent to me from Kalgoorlie and Nannine.

It has rather an attractive voice, though its shy nature necessitates extremely gentle "wooing." Upon observation it immediately dives into a thicket, and its music at once ceases. Actively skipping about the ground most of its time is spent. Like the Tits and Wrens it is insectivorous, and should always be considered a friendly native of the cultivated areas of the dry districts.

Nest.—Placed very near the ground; oval; side entrance; made of grass and lined with feathers.

Eggs.—Three or four to a sitting; dull bronzy-brown, faintly zoned at the larger end. Length, 0.75 inch; breadth, 0.6 inch.

CHESTNUT-RUMPED GROUND WREN.

Hylacola pyrrhopygia, Vig. and Hors. (*Hi-lac'o-lä pīr-o-pī'je-ä*).

Hute, a forest; *colore*, to dwell; *purros*, reddish; *puge*, rump

Hylacola pyrrhopygia, Gould, "Birds of Australia," fol. vol. iii., pl. 39. "Key to the Birds of Australia." Hall, p. 28 (1899).

GEOGRAPHICAL DISTRIBUTION.—Areas 9, 7, 6, 3.

KEY TO THE SPECIES.—General color above russet-brown; upper tail coverts light chestnut; wing coverts like back, the median and greater tipped with whitish; quills brown, tail feathers light reddish brown, all but two centre feathers, with distinct black bar and ends ashy-brown; lores and a narrow eyebrow whitish; under surface of body dull-whitish, thickly spotted with dusky-brown on throat, breast, and sides of body; under tail coverts bright chestnut, with white tips. Total length, 5.25 inch; bill 0.6 inch; wing 2.1 inch; tail 2.5 inch.

Many of our desert birds are specially noted for some one way or other. The present form has the sweet voice, but because of its retiring habit one seldom meets it face to face for a fair expression of ideas. Many birds surely have an amount of the latter shyness.

It rarely flies, preferring to thread the densest bushes, or hop upon the ground with its tail erect. In certain belts of dry timber it may be fairly plentiful, but one may go a long way and not see it. A patient observer should find it hunting for insects among the grasses, or hear it pouring forth a melody of song from a tussock-top.

Nest.—Dome-shaped with side entrances ; made of grasses lined with feathers.

Eggs.—Three or four to a sitting ; oval in shape, surface glossy, light purplish buff, spotted moderately with amber and zoned. Length, 0·77 inch ; breadth, 0·56 inch. (A. J. CAMPBELL.)

FIELD WREN.

Calamanthus campestris, Gld. (*Kal'a-manth-us kam-pes'tris*).

Calamus, a reed ; *anthus*, a small bird ; *campus*, a field. (*Campestris*, pertaining to a field)

Calamanthus campestris, Gould, "Birds of Australia," fol. vol iii., pl. 71. "Key to the Birds of Australia." Hall, p. 30 (1899).

GEOGRAPHICAL DISTRIBUTION.—Areas 9, 6.

KEY TO THE SPECIES.—Head rufous, nearly uniform, or with narrow black streaks ; breast pale yellow, distinctly streaked with dusky-brown ; under tail coverts light rufous and brown, with white tips ; secondaries about equal. Wing 2·25 inches ; tarsus 1 inch.

The three known species of Field-Wren are ground-loving, and actively move among the stunted shrubs of the inner and southern plains, and among the rank grasses. One is found in the Eyrean sub-region, a second in South-east Australia, and the third in Western and Southern Australia.

It has an agreeable whistle, and when perched upon the top of a bush one cannot but be attracted at the sweetness of the voice. When disturbed it seeks shelter in the bush, or runs along the ground for a considerable distance, taking care to be out of sight as much as possible. Its food consists of beetles, and small vermin other than insects.

Nest.—Cup-shape ; made of grasses, and lightly lined by feathers within it. It is placed very near the ground at the base of a bush or tussock.

Eggs.—Three to a sitting ; reddish-brown to chocolate in appearance, with faint spots assimilating at the larger end. The eggs are much bulged in appearance. Length, 0·75 inch ; breadth, 0·5 inch.

The proper time to open a beehive, when food is scarce, is before sunrise or after sundown ; but if the stock is removed to a distance, under a tree, or to an outhouse, it may be examined at any time. In all operations, while honey is scarce, be sure that no combs are left unprotected ; in fact, this ought to be observed at all times ; not a drop of honey or syrup ought to be within reach of the bees, as it only encourages thieving. It is much easier to raise honest bees, and keep them so, than to reform those that have learnt to steal from their neighbour. Bees when swarming are good-natured, and gentle, because just before starting for a new home, which they may not reach for days, they fill themselves with honey, and are consequently in an amiable mood like the average man after a hearty meal.



FIELD-WREN.
(See page 86.)

THE HONEY BEE.

By R. HELMS.

LIFE HISTORY.

II.—THE DEVELOPMENT OF BEES.

The evolutionary process of the bee, as with other insects of the higher orders, progresses steadily through four distinctly defined forms. But these characteristic stages, regarding a definite duration, vary to some extent with the three kinds of bees found in a colony. The cycle of forms in the life history of the bee embraces the ovum (or egg), larva, pupa, and imago (or perfect insect), which again produces the lowest form—the egg, occurring alternately. Two stages of this transfer motion are quiescent, namely, the ovum and the pupa, the other two, the larva and the imago, being active. The gradation of these phases, although readily recognisable at certain periods, are hidden under protective coverings.

THE OVUM.

The egg is deposited at the bottom of the cell, to which it is fastened in a rectangular position by a glutinous substance secreted in the oviduct of the mother. Its length is about one-sixteenth of an inch, and scarcely a third as wide at its thickest part. Its appearance is glossy white, and by the aid of a magnifying glass the outer vestment is seen to be covered with a regular network. At the upper and broader end the threads of this network converge towards a shallow depression, in the middle of which the membranous shell of the egg is perforated by a microscopic opening. This orifice is technically termed micropyle (small gate). It extends as far as the yolk of the egg, and serves the purpose of admitting the fertilizing cell called spermatozoon. This, the male germ, enters the egg with a wriggling motion, and rapidly coalesces with the ovulum, or female germ, which is enclosed in the yolk.

Internally the structure of a bee egg much resembles that of any bird's egg on a small scale, but the colouration between the yolk and the white is not distinct as in those. The yolk and the white in the bee egg act functionally also in the same manner as is known these substances do in the eggs of all other animals. The yolk containing the ovulum beginning from this cell develops into an embryo, and the embryo gradually absorbs the white, which serves no other purpose than that of nutrition. With the help of moderate warmth the development within the egg is completed in three days. In the meantime the egg has gradually bent down and now is found in a declining position; the integument ruptures and a small white maggot, the larva, emerges, actively demonstrating the marvel of nature—the beginning of an additional new life.

Part of the foregoing applies only to eggs from which queens or workers, according to the treatment of the larvæ, will arise.

The eggs from which drones emanate are originally the same as all other bee eggs, and cannot be distinguished from them. But one of the strangest phenomena in nature is found connected with them, namely, they remain unfertilised and yet produce young. This marvellous fact is well authenticated and scientifically proved. Every fertilised egg, unless prematurely destroyed, must ultimately produce either a queen or a worker, and every unfertilised egg, without exception, develops into a drone. The nature of every egg when in the ovary of the female, therefore, is male; when during the laying operation a specialised cell, originally emanating from the male, is added and successfully coalesces with the ovulum, the sex of the egg is changed to that of a female.

The interesting subject of parthenogenesis (the maidenly reproduction) amongst bees demands frequently being attended to in succeeding chapters, and will be specially discussed later on.

THE LARVA.

The first active stage of bee life is variously termed maggot, or grub, and also, but erroneously, caterpillar, and worm. Even grub is objectionable, because this term implies boring and grubbing, and, strictly speaking, should only be applied to the larvæ of beetles which mostly bore in wood or the ground. They, moreover, are possessed of feet, whilst maggots are footless larvæ as those of bees, and for this reason the term is characteristic, but it unfortunately reminds of unsavory associations. The latin word *larva* is perhaps the best to use, it being a general term applied to all insects when in the second stage. It signifies a mark, and it seems to have been chosen in allusion to the hidden forms that will evolve from it in time.

On its first appearance, naturally smaller than the egg, the larva grows rapidly, and in about five days increases to fifteen hundred times its original weight. At first stretched out it soon finds the cell too narrow for a straight position and consequently curves in accordance with the room it has to accommodate itself to till ultimately it lies in almost a perfect circle with the mouth touching the tail. All the time it is surrounded by food pap, which it swallows and, to some extent, may also absorb through the skin. Besides finding the width of its cradle too limited for an outstretched position, it is also embarrassed by its own covering. The rapid growth of the larva does not extend to its outer skin, which soon gets too tight for its comforts, and, not yielding, is ruptured and cast off; a new one, more elastic, which has been formed underneath, taking the place of the old one. Soon this skin again becomes too narrow and another moulting is necessary, such cast being of daily repetition. The helpless, fat and whitish looking baby moves slowly around whilst floating or, more correctly speaking, hanging upon its food.

Twelve slight constrictions work its body, thereby dividing it into thirteen segments. The first segment bears the eyeless head, having a mouth with soft lips and jaws. The simple intestine is

without an anal opening. The *foeces*, in consequence, cannot be discharged in the ordinary way, and are detained within the body until the last moult. A number of the segments are provided with breathing orifices or *spiracles*, which lead into ramifying tubes, called *tracheae*, extending through the body to perform the office of lungs. A nerve cord runs through the whole length of the body, forming at every segment, knots (*ganglia*), whence nerve-threads branch in all directions. Thus the breathing apparatus, as well as the nerve system, becomes somewhat difficult to distinguish between towards its terminal boundaries and superficially may be easily mistaken one for the other. The organ of circulation on the other hand, is extremely simple. It consists of a long tube, the heart in insects, extending along the back wherein the white blood is wooed along from the front backwards.

In order to build up the rapidly developing body of the larva, which is the only growing stage with most insects, and during which time the foundation of all the intricate organs of the perfect insect is laid, food must be very nutritious, readily digestible, and supplied in sufficient quantities. This is provided by the "nurses"—the youngest bees in a colony—and is varied according to the age of the baby. For the first three days it consists of a highly nitrogenous substance, milky in appearance and entirely assimilable. On the third day this food is replaced by a mixture of honey and pollen dissolved in water, from which the indigestible cellulose of the pollen grains is retained in the sack that forms the intestine. After the fifth day all feeding ceases, and the cell is then covered with a thin layer of wax wherewith some grains of pollen is mixed to allow the cover to be slightly porous. The process of preparing the lid is known as "sealing" the cells.

As soon as sealed up the larva stretches itself length-ways in the cell, keeping the head towards the bottom of it. In this position it probably first finishes the balance of food still left, and then passes through one of the most remarkable and interesting processes in its life history. In consequence of the absence of an anal opening the indigestible parts of the food swallowed during the past two days, and mainly consisting of husks of the pollen grains, have accumulated in the intestine. This waste matter has to be got rid of without soiling the walls of the cell. The simple structure of the bag-like intestine assists in the process, for its inner membrane is now vomited forth together with its contents. The outer skin of the larva is cast at the same time, and being continuous with the lining of the intestine which, as will be understood, is now inverted, forms a close lining to the cell. The refuse that had been left in the intestine is thus buried at the bottom of the cell, and in this manner prevented from soiling the inhabitant. As demonstrated, it will be seen that the last moult of the larva is an internal as well as external one.

The above description of development is applicable in all its minutæ only to that of the worker larva. That of the queen and of the drone progresses somewhat differently.

Besides being reared in specially constructed cells, called queen or royal cells, the larvæ intended to produce sexually perfect females, are fed throughout with the readily assimilated nitrogenous substance given to the worker larvæ during the first three days of their life. It has received the name of "royal jelly" for this reason and, moreover, is supplied in such profusion that it never can be completely used up by the larva floating half buried in it. The cells of these favourite larvæ are much elongated and pendulously attached to the comb, and strongly built to allow them being crowded by the bees without becoming injured. They have room for any amount of surplus food, and besides allow for a larger development of their occupants. Up to the fifth day the development of the royal larva apparently progresses at the same rate as that of the worker, but afterwards it advances much more rapidly.

The drone larvæ are reared in hexagonal cells which are wider and slightly longer than those of the workers. They receive the rich nitrogenous and entirely assimilable food for about four days and a half, and subsequently honey and pollen for a day and a half more. On the sixth day the cells are sealed, a day later than that containing the other sex.

It is evident that the full development of the sexual organs principally depends upon the more profuse and longer extended supply of the nitrogenous food substance given to the young larvæ. Those of the workers are fed upon it for three days, the drone larvæ for four and a half days, and the royal larvæ are liberally provided with it for five days, or during the whole time of this phase of life.

After the larvæ have passed through their last moult they turn round and face the sealed end of the cell. In this position they remain during the following transformations.

THE PUPA.

The pupa stage is a quiescent one and the third in the life history of the bee. The name signifies little girl, doll or puppet. Other names given to the third stage of insects are nymph and chrysalis. The first of these means bride, and is frequently applied when no leathery covering occurs; whilst the second was originally given to the pupæ of butterflies and moths in allusion to the golden sheaths and glittering spangles many of them are covered with; *chrysos* meaning gold in Greek.

As soon as the larva has turned round it begins to spin a loose cocoon, which, when finished, will cover it a little more than half way down. The queen larva completes this cocoon in about a day, the worker larva in two, and that of the drone in three. As the spinning of the cocoon is very exhausting, rest is required by the larvæ in consequence. This period of apparent rest, forming the transition between the larva and pupa stage proper, varies with the already differentiated females, *inter se*, and the males. Thus this transition stage of a queen larva lasts about two days, whilst that of the worker takes three, and a drone larva occupies four

days to pass through it. After that the development proceeds rapidly, and within a day the limbs and different appendages appear outlined on the semi-transparent body of the pupa. At this stage the name bride (nymph) is certainly not inappropriate; the gentle figure, veiled to its waist in gossamer, suggests such a comparison.

The further development proceeds very quickly, considering the extraordinary anatomical and physiological changes now taking place. In a marvellously short space of time the full-grown limbless maggot is transformed into a highly organised flying insect. This is more particularly astounding with the pupa of the queen which progresses from this out at more than double the rate than those of either the worker or drone.

THE IMAGO.

The perfect insect, the fourth stage of its life history, is called imago, from being a portrait or image of its parents. During the process of maturing whilst in the pupal stage, in addition to the other members, a strong pair of jaws have made their appearance. The bee, when fully formed, is anxious to leave the cell and escape confinement. The jaws are the first organs to be brought into play. With these they cut a circular furrow through the capping and then push the lid away with the head and crawl out. At first the wings are folded close over its back and the hairs of its body are lying down, all being slightly moist, which gives the little animal a flabby appearance. But soon this alters. The warmth within the hive quickly dries the little creature, the hairs rise up, the veins of the wings get filled with air and they expand, every portion of the covering sets firmly, and the bee has reached its full size. It does not grow after emerging from the cell, all its growing is done when in the larval stage. Only the queen gets considerably bigger after being fertilised, caused by the development of the ovaries expanding the abdominal segments. All three kinds of bees acquire their full power of motion almost immediately after leaving the cell, and are soon ready to assume the functions assigned to them by nature.

From the time the egg is laid a queen matures in 16 days (or rather less), a worker in 21, and a drone in 24 days. This is the normal time, and hardly ever varies with the queen and rarely with the drone, because whenever these are reared there are, as a rule, large numbers of workers present in the hive to produce the necessary warmth required for hatching them. The development of the workers may, however, occasionally be retarded in a weak colony during cool weather.

Economy in labor means to use the labor-saving implements. Hand labor may be cheap, but the day is past when it can compete with the machine. The farmer must use the machine or implement to avoid being crushed to the wall.

CHAMPION RAMS.

The two illustrations published in this issue may be of interest to our readers, as being the Champion Sheep in the Long-wool and Merino sections respectively at the Seventh Annual Show of the N.S.W. Sheep-breeders' Association, held in Sydney early in July of the present year.

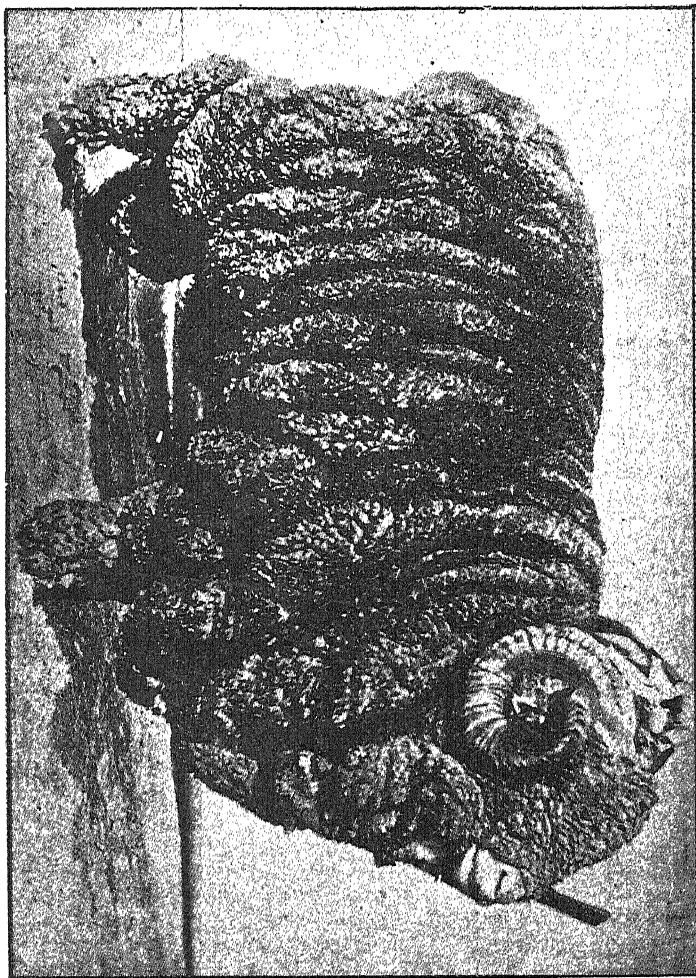
The Champion Long-wool Lincoln ram was bred by Mr. J. A. Wallace on his stud farm near Orange, N.S.W. Since his stud was established over 25 years ago, Mr. Wallace has aimed at producing an animal able to carry a heavy fleece of great quality, combined with a hardy constitution. In this he can claim to have succeeded, for during the past six years he has won over 500 prizes at shows. He started with the best strains available from England, New Zealand and Victoria, and his stud flock now comprises 1000 choice Lincolns.

The Grand Champion Merino ram is from the well-known estate of Hon. S. M'Caughey, of N.S.W. The following excerpt from the report of the show gives an account of this ram:—The best aged ram of the show was found in the strong wool classes, Mr. M'Caughey's The Honourable, a son of Federal, carrying off the great coveted prize of the show. This ram is very dense, splendidly clad beneath, even in quality, and square on top, with a fine flank. He is not quite three years old. His head is rather on the fine side. Perhaps no other sheepbreeder in the world can afford to sell the majority of his show sheep, especially the ewes, immediately after the show is over. Yet this has just been done by Mr. S. M'Caughey, who has sold privately all the ewes, 26 in number, exhibited at the late sheepbreeders' show, for 80 guineas each. He has also parted, to the same purchasers, with The Honourable, the grand champion ram, and United States, another prize-winning ram for 1,400 guineas, and the ram lamb, Yankee Lad, for 400 guineas, the total purchase money for the 29 sheep being £4,074. The buyers are all breeders from this State.

SEED DISTRIBUTION.

A distribution of maize seed, grown at the Experiment Plot at Drakesbrook, will be made on September 2nd. The seed will be distributed in small quantities for experimental purposes, and all applications for the same should be in the hands of the Secretary of the Department of Agriculture by August 31st.

Profit in farming consists as much in saving expenses as in deriving an income. A farmer should never buy what he can produce. Then what he sells is largely profit.



HON. S. M'CATGHEY'S GRAND CHAMPION MERINO RAM.
(See page 94.)

PIG FEEDING ON PURCHASED FOODS.

BY "AGRED."

Nine out of every ten men who have tried pig keeping exclusively, or nearly so, on purchased foodstuffs say that the average price paid by the butchers for pork does not cover the cost of production. I have always contended in previous articles on pig keeping that the profits that result from this system of feeding cannot be expected to attain the dimensions which the inexperienced desire, or imagine to be obtainable, and have advised those whose only profit is the cash profit to keep out of this business; and while I have never given any balance sheets, I have maintained that the nine men in ten who insist that pork cannot be grown for $6\frac{1}{2}$ d. per lb. on foodstuffs, such as wheat, pollard, oilcake, etc., at their local values are wrong, and that their failure to bring out a profit is due to some mismanagement in their piggeries. The following statement is not to be supposed to aim at actuarial precision, nor are the results supposed to define the limitation of profits derivable from such feeding. An indication, roughly accurate, of what may fairly be expected from feeding pigs liberally is all that can be conveyed:—

Sale of Porkers	...	...	...	£198	9	0
5 Porkers on hand	...	...	...	8	15	0
4 Baconers	...	...	...	14	0	0
Oilcake	...	...	...	1	12	6
Pollard	...	...	...	4	11	0
Barley	...	...	...	8	3	0
18 Weaners at (say) 8s.	...	...	...	7	4	0
Bacon	...	...	...	4	1	0
Sale of surplus empty bags	...	...	...	3	5	6
<hr/>						
				£250	1	0
Purchase of foodstuffs	...	...	...	164	0	6
<hr/>						
				£86	0	6

During the eight months or so that the above balance covers, 22 weaners were sold at a slight increase on their pork values, the price paid being 6d. per lb. live weight, less 3lb. allowance. In all other instances the returns are from the wholesale price of pork in Perth. The estimates of stock on hand are certainly below real value, and the present time for showing results has been chosen because there are few "estimates" to give. There are several places where leakage of profit occurs that could in many instances be conveniently stopped. As a rule, 19cwt. of foodstuff has been received as a ton, while the butcher has invariably discovered a more considerable shrinkage than—I have no hesitation in saying—occurred. Situated between thirty and forty miles out of Perth, foods have cost on an average guineas instead of pounds—that is on every £7 expended in foods an additional 7s. have gone in freight on rail.

From the further experience of local conditions acquired during the period in question, there are evidently some points in management that will enable better results to be gained in future, other things being equal. It should be said that all sows when in pig have received their allowance from the purchased foods as well as when suckling, and that the only addition to purchased foods has been an indeterminate but inconsiderable amount of greenstuffs. Many of the porkers, however, hardly ever tasted green food, as the respect I hear for this diet in producing pork is exceedingly slender.

It will be observed that no debit has been made for labor in tending. If cash profit were the only one, such would be necessary. But most farmers who feed pigs allow the value of the manure to cover the cost of tending. This it most certainly does. One third of a man's time is amply sufficient to do the necessary work in the conditions in question. Allowing £2 per week as his wages and debiting the piggery with one third for nine months, there is about £24 to be set off against the value of the manure resulting from the use of £164 worth of foodstuffs. Now, while no invariable relation exists between the price of foods and the comparative value of the residual manure after feeding, it will be found that there is generally an approximate relation in values, which has been stated thus. If the manure has been properly managed and not been allowed to go to waste, one-third of the cost of the food will be nearly the money value of the manure. In the present instance let one fourth be taken as the value, and there is the secondary profit of £41 to cover the £24 due for labour and leave a margin for interest, wear and tear, and any other detail the carping critic cares to bring up, and if that margin is too thin, there is the poultry yard and egg basket, in which, if his eyes are clear, he will see the waste and offal of the pigs as a third profit. The prices that have been paid for foods have varied little during the time—pollard, £7 per 2,000 lbs.; crushed wheat, 4s. 6d. per bushel; peas, 4s. 3d. per bushel; oil cake, £7 per ton. It is to be hoped that in the near future the price of these foods may be reduced from their present absurd inflation, both for the sake of the consumers and producers of pork.

CANDIED PEEL.—To candy orange and lemon peel cut the fruit lengthwise and remove the pulp. Soak the peels in salt and water for three or four days, then boil in fresh water till soft. Place on a sieve to drain. Make a syrup of one pound of sugar to one quart of water, and in this boil the peels again till clear. Then make a very strong syrup by mixing sugar with just sufficient water to melt it. Boil the peels in this slowly till the sugar candies, then take them out, strew powdered sugar over them, and dry either before the fire or in a cool oven.

CONFERENCE OF PRODUCERS.

A gathering of fruitgrowers and producers was held at the Mechanics' Institute, Perth, on July 19th, for the purpose of discussing certain matters of interest.

The meeting was fairly well attended, and amongst those present were Messrs. F. H. Piesse, M.L.A.; C. Harper, M.L.A.; L. Nanson, M.L.A.; M. H. Jacoby, M.L.A.; T. F. Quinlan, M.L.A.; Dr. Hicks, M.L.A.; R. D. Hutchinson, M.L.A.; Teesdale Smith, M.L.A.; W. J. George, M.L.A.; C. A. Piesse, M.L.C.; W. J. Butcher, M.L.A.; G. Throssell, M.L.A.; C. H. Rason, M.L.A.; L. Lindley-Cowen, Secretary to the Department of Agriculture; and A. Despeissis, Horticultural and Viticultural Expert to the Department.

The delegates from the various societies were:—Messrs. G. Meagher and E. C. Bechynden (Boyonup Brook Agricultural and Vigilance Committee); M. J. McEwin (Cookernup Farmers' Progress Association); E. Y. Clifton, (Waterloo Farmers' and Vine Growers' Association); T. C. Woods (Walliabup Progress and Horticultural Association); T. F. Quinlan, M.L.A., W. A. Denison (Toodyay Vine and Fruit Growers' Association); Southern Districts Agricultural Association: J. L. Lockyer (President of the Society), T. James, W. T. Murray; J. Butcher (Kelmescott and Armadale Agricultural Society); J. M. Whistler (Boyanup Farmers' and Progress Association); G. T. Proudfoot (Harvey Farmers' Club); Ferguson Farmers' Progress Association (two delegates); Lyon (Thompson's Brook Progress Association); D. McKenzie, A. A. Morgan (Geraldton Agricultural and Horticultural Society); P. Urch, Jacob Schmitt (Darling Range Vine and Fruit Growers' Association); Laubig (Great Southern Agricultural Society); W. Sounness (Mount Barker and District Settlers' Association); W. F. Graham (Narrogin-Cuballing Agricultural Alliance); J. Cain (Deepdale Farmers' and Fruit Growers' Association); Johnson and Hamilton (Upper Preston Progress Association); Murray Farmers' and Fruit Growers' Co-operative Association (two delegates); Duyat (King River and Albany Settlers' Association); Doust and Hester (Nelson Agricultural Society); Pitman and Dalton (Waroona Agricultural Society); Vanzuilecom (Kojonup Agricultural Society). The Conference was thus a most representative one, and it was stated that only seven of all the societies invited had failed to send delegates. Mr. J. A. Allnut was elected to the chair, and Mr. A. Hall was elected secretary.

Mr. F. H. Piesse explained the objects of the meeting, and after considerable discussion it was resolved that a deputation wait on the Premier at an early date.

On July 29th Messrs. F. H. Piesse, C. Harper and M. Jacoby, M.L.A's., waited upon the Premier and Minister of Lands and brought under their notice the resolutions carried at the meeting referred to above, which were as follows:—

1. That, in view of the calamity which has resulted to the fruitgrowers in the eastern States in consequence of the introduction of phylloxera, codlin moth, and other pests, this meeting is of opinion that no expense should be spared or vigilance relaxed in endeavouring to prevent such pests from becoming established in this State, and that this meeting is of opinion that, in the case of any portion of a consignment of fruit being found to be infested with any of the more destructive pests, the whole of such consignment should at once be destroyed.

2. That clause 21 of the fruit regulations be amended by striking out the word "may" and inserting the word "shall." (The effect of this suggestion, if adopted, would be to make it obligatory on inspectors or other authorised officers or any officer of Customs, after inspecting imported fruit, to demand the production of a certificate from the Government Inspector at the port of shipment, declaring such fruit had been examined before shipment, and found to be clean and free from disease.)

3. That, in view of the losses caused by the existence of the fruit fly in and around Perth, it is desirable that strenuous efforts should be made in the immediate future to attempt its extermination.

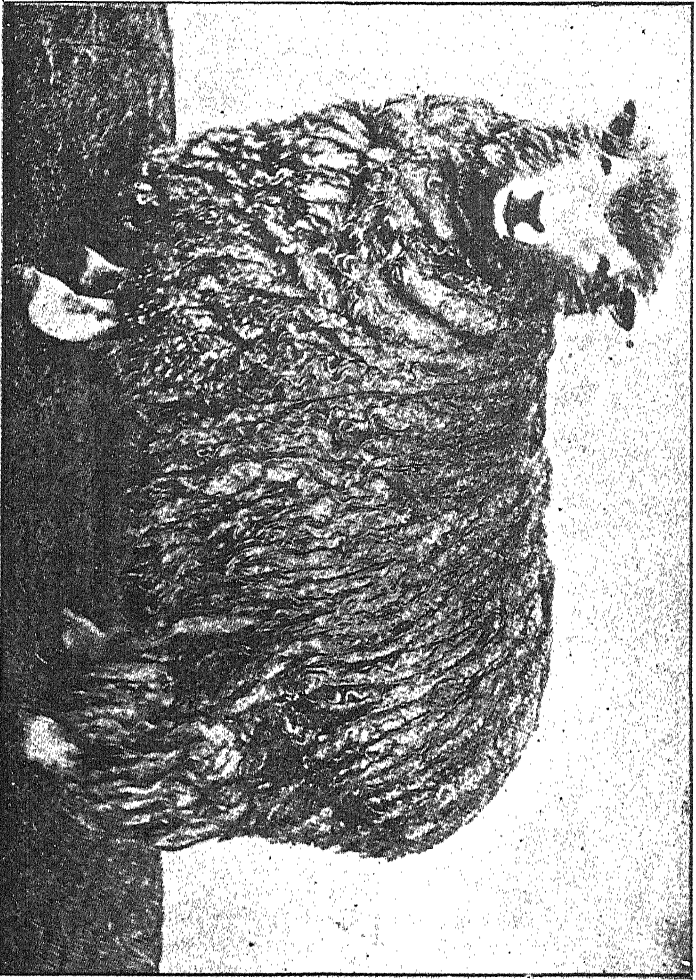
4. That, in the opinion of this meeting, as there is more danger of introducing codlin moth in apples from December 1 to May 1, all importation during that period should be prohibited, and that permission to do so be sought from the Federal Parliament.

5. That, in view of the inevitable decline of values in farm products, and the increased difficulties of obtaining farm labor, and consequently the great cost of clearing, it is a matter of urgent importance that greatly increased facilities should be provided for farmers in roads and bridges, to enable them to get their products to the railways, and in platforms, sheds, and truck accommodation, to enable their products to be put on the market with the least possible loss and expense.

6. That, in view of the prohibition on apples, pears, etc., having been removed, in the event of the codlin moth being introduced into this State, the Government should provide funds to immediately stamp out the disease, and compensate growers for loss and damage done.

7. That the Government be requested to appoint its own inspectors in each port of shipment in the other States, and that permission be sought from the Commonwealth Government to grant power to inspect and refuse permission to ship to Western Australia any fruit found to be infected with fungi or insect pests.

8. That this meeting is of opinion that, for the purpose of efficient inspection, Fremantle should be the only port of entry in Western Australia for apples, pears, and quinces south of the 26th parallel.



J. A. WALLACE'S GRAND CHAMPION LONG-WOOL (LINCOLN) RAM.
(See page 114.)

9. That special trucks be set apart for the purpose of conveying the fruit from the ship's side to the fumigating dépôt.

The Premier, in replying, stated in reference to the first request that instructions had been given that from August 4 the regulations should be more strictly enforced, as the fruit that was being sent to the State from the East was not of the high standard that they had anticipated. Though they could not consent to the destruction of a whole consignment on a portion of it being found to be infected with any of the more destructive pests, they would agree that if one or more apples were found to be affected by the codlin moth, the whole of the fruit in the particular case should be destroyed. By doing this they would compel the exporters to be very careful in the selection of the fruit for export to this country. As to the next request, instructions had already been given that inspectors must insist upon a certificate from a Government Inspector at the port of shipment being produced to show that the fruit had been examined before shipment, and found to be clean and free from disease. Every effort would also be made during the coming season to exterminate the fruit fly. In reference to the next request—that the importation of apples between December 1 and May 1 should be prohibited—that could not be agreed to, for that was really the fruit season.

Mr. Piesse asked that the request should be considered, and the Premier assented. Mr. Leake added that greater care, if possible, should be exercised by the inspectors during that period than during the other part of the year.

Continuing, the Premier stated that the requests for increased facilities for farmers—in the direction of roads and bridges, and platforms, and sheds and truck accommodation—would be specially considered, and they would do all they could to assist the farmers. Funds would also be provided to stamp out the codlin moth if it made its appearance, but the question of compensating growers for any loss they might sustain through the pest was a matter for the consideration of Parliament. It was impossible for the Government to appoint inspectors at each port of shipment in the other States, unless those States assented. The Government would like to meet the deputation in the matter, and thought they might provide the men and the salaries; at any rate they would give the request consideration, and see what could be done. In connection with the request that Fremantle should be the only port of entry, it would be well to remember that the chief part of the trade done with Albany would be for transshipment to Esperance, and not so much for the town of Albany itself.

The deputation stated that they had no objection to Esperance being made a port of entry for fruit, nor to fruit being landed at Albany for transshipment to Esperance, so long as the fruit was not unpacked at Albany, but remained in the Customs or on a hulk in the harbour. They thought that point should be conceded, on account of the close proximity of Albany to the orchard districts.

The Premier answered that the matter would be considered. In reference to the last request—that special trucks should be set apart for conveying the fruit from the ship's side to the fumigating dopôt—the Government would agree to that. In future closed trucks would be used, and on the fruit being taken from them the vehicles would be thoroughly fumigated by the officers of the Department before being allowed to go into use for any other purpose.

DRIED BLOOD AS A TONIC FOR YOUNG CALVES.

For two years the Kansas Experiment Station has used dried blood in connection with its experiments in feeding calves. In a bulletin just issued they say :—" In March, 1899, one of our cows gave birth to a calf weighing eighty-six pounds. This calf was allowed to suck for several weeks, to assist in reducing the inflammation in the dam's udder. On account of poor quality and quantity of milk, the calf did very poorly, and to save its life it became necessary to remove him from his dam. With the ordinary treatment accorded our calves he grew worse and worse, and when seventy-nine days old weighed only ninety pounds, or four pounds heavier than at birth. Although no one would have given ten cents for the calf at this time, an effort was made to bring him out. He was given castor oil, laudanum, fresh eggs, calf meal, and, as a last resort, dried blood. With the blood the calf commenced to improve, and in a short time was gaining at the rate of nearly fourteen pounds per week, and not infrequently as high as seventeen to eighteen pounds per week. When a year old he weighed five hundred and seventy eight pounds—a pretty good record for a calf that gained only four pounds for the first seventy-nine days of its existence. The dried blood consumed during parts of three months amounted to seven and one-half pounds. At two cents per pound, the cost was fifteen cents.

In October, 1900, a heifer belonging to the Agricultural College dropped her first calf. The calf was small and sickly, and for the first few weeks did very poorly, as is shown by the fact that on December 1 it weighed two pounds less than on November 1. For a few weeks its life was in a very critical condition, but when induced to eat a little dried blood with its milk it began to improve, and has been making fair gains ever since.

Dried blood is not only good for a weak calf, but is an excellent remedy for any calf subject to scours. The Kansas Experiment Station has just purchased twenty young calves. Frequently these calves arrive at the Station badly affected with scours; a little dried blood always brings about a cure. Recently a test was made with five calves that happened to be scouring at the same time. With two of these dried blood was fed after reducing the regular feed of milk. With the other three the dried blood was fed without

changing the supply of milk. In the former case the calves recovered from the scours after two feeds ; in the latter after three feeds. With the seventy head of young calves under experiment at the Kansas Station during the past year, there has not been a single case of scours that dried blood has failed to check.

In feeding dried blood, a teaspoonful at a feed is a great plenty. This should be continued until the scours disappear. In case of a weak calf, the allowance may be gradually increased to a tablespoonful at a feed. To prevent the dried blood from settling to the bottom of the pail, where the calf will be unable to get it, it may be stirred in the milk while the calf is drinking, or the milk and the blood may be fed immediately after being thoroughly mixed. Since dried blood is such a cheap and effective remedy, it will pay anyone who raises young calves by hand to have a little available whenever a calf shows signs of disorders in its digestive tract. It can be obtained from any of the large packers. When ordering, state that the blood is wanted for feeding purposes.—D. H. OTIS.

PRUNING DEMONSTRATION.

The Secretary of the Department of Agriculture has received the following report from Mr. Despeissis, the horticultural and viticultural expert:—

“As arranged by the Albany and King River Settlers' Association, I met a group of settlers on Mr. Newman's farm on the King River on the 17th of July, and gave a demonstration in fruit tree pruning. Fruit-growing has of late received much attention in that locality, where numerous young orchards have sprung into existence. Rich soil and humid cool climate both combine to a luxuriant growth of trees, which in many instances require checking more than it does coaxing. High winds are at times troublesome, more especially in orchards where the trees, instead of being cut back, have been allowed to run up to a great height.

“I also visited several orchards in the locality, and regret I had to abandon a visit to the Porongorups on account of pressure of time and threatening weather. This trip, as well also as a visit to the orchards about Mount Barker, I propose to undertake shortly.”

It may not be generally known that wheat is not the largest grain crop produced. Maize stands first with 2,778,108,000 bushels to its credit in 1900, against 2,468,799,000 bushels of wheat. Nearly the whole of the maize was grown in the American continent.

RABBIT CONTROL AND DESTRUCTION.

BY ALEX. BRUCE.

Chief Inspector of Stock for N.S.W.

(From the *Agricultural Gazette of N.S.W.*)

In issuing these directions for the control and destruction of rabbits, it may be explained that it is not desired, nor is any attempt made, to instruct those owners in the Western and Central Divisions of the State who have for many years been battling desperately with the pest, or to detract from the worth of the methods they have pursued; but the object is to afford our pastoralists and farmers in the eastern portions of the State, whose holdings have only recently been invaded, the benefit of the practical experience of their fellow pastoralists in the early infested portions, with regard to the means they have found most effective. They are—

- I. Rabbit-proof Fencing.
- II. Poisoning.
- III. Trapping.
- IV. Fumigation.
- V. Destruction of Rabbit harbour.

I. RABBIT-PROOF FENCING.

There is a consensus of opinion among those who have had most to do with fighting the rabbits in the flat, unbroken country in the Western and Central Land divisions of the State (which contain about two-thirds of the whole area), that enclosing the holdings with rabbit-proof fencing is one of the most effective means of dealing with the pest.

Acting on this opinion, miles of fences have been wire-netted by our pastoralists, and if it had not been for the succession of severe droughts from which they have suffered, and the loss of stock they have sustained, the extent of rabbit fencing would have been considerably increased.

It can be confidently recommended, therefore, that in the portions of the State alluded to, both pastoralists and agriculturalists should, if they can obtain on reasonable terms the necessary funds, erect rabbit fences, either individually or in groups.

In the eastern portion of the State, where the greater part of the country is intersected by creeks, gullies, and other water-courses, wire netting could not be generally adopted, but even in that division there are portions which could and should be enclosed by rabbit fences.

II. DESTRUCTION OF RABBITS BY POISON.

This is allowed on all hands to be the handiest, least expensive, and most effective method of destroying rabbits.

Full information is here given for the use of the different sorts of poisons found effective, and the mediums in which they should be laid.

III. TRAPPING.

Excellent work has been done by poisoned water and trapping. In the dry portions of the State preparations should be made for these methods. In fact, wherever stock are watered at tanks, wells, or other places which can be economically and effectually enclosed with wire-netting, the necessary appliances should be erected, and when the season suited, brought into operation.

IV. FUMIGATION.

Although there are other modes of fumigating than by bisulphide of carbon, which have proved effective, they are comparatively cumbersome, and as it is to be hoped that the owners in the eastern part of the State will not allow the rabbits to form warrens, or even large burrows, fumigation would only have to be carried out under the rocks and among the roots of trees where the burrows could not be dug out, and the carbon would, under such circumstances, answer every purpose.

V. DESTRUCTION OF RABBIT HARBOUR.

Comparatively little has been done in this State in destroying rabbit harbour by digging out the burrows, burning off hollow logs, log and brush fences, and fallen timber; but in Victoria, Tasmania, and New Zealand large sums have been expended in such work.

The suggestions here made, and the directions given are, as already stated, based on the views held by our experienced pastoralists, which have been confirmed by the reports of the officers in charge of the work of rabbit destruction in the States of Queensland and Victoria, as well as that of the Secretary of Agriculture, New Zealand, to whom this and other questions relating to the control of the rabbit pest were recently referred by the Department.

NECESSITY FOR PROMPT AND EFFECTIVE ACTION BY THE BOARDS.

While there is no question as to the arduous and difficult nature of the work which our pastoralists and agriculturalists have to undertake in fighting the rabbit pest, we are assured by those who can speak from their personal experience, that when the country is enclosed with a secure rabbit-proof fence, which is regularly and carefully patrolled and maintained, and poisoning and the other methods to which attention is here called for destroying the rabbits, are systematically and persistently followed up, they can be kept thoroughly in check at little cost. It is also stated on reliable authority that—even without rabbit fencing, if the holdings are not in the neighbourhood of unoccupied Crown lands, or lands reserved from lease—the rabbits can, by these methods, where the pastoralists and agriculturalists heartily and simultaneously co-operate in their destruction, be kept well under control at no very great expense.

If, therefore, all occupiers of land infested with rabbits were to promptly adopt these methods, the work of controlling the pest even on unnetted holdings would be neither difficult nor costly.

But while this is the case, it is certain that in not a few instances in all parts of the State, occupiers will fail to destroy the rabbits on their land and the Directors will have to exercise the large powers which the law confers upon them, and either prosecute the defaulters for neglect, or put men on their holdings to do the work and charge the occupiers with the expense. Unless prompt and effective action is taken by the Directors with defaulters, money and labour expended by those owners who are working well and doing their duty will be wasted, and the rabbits will continue to spread, while the devastation and loss which directly and indirectly they have brought upon our pastoralists and the State, and which already amounts to many millions sterling, will still go on. Indeed the rabbit pest can only be likened to and dealt with successfully as a fire : it must be speedily mastered or it will be master ; and the Directors by promptly compelling the defaulter to do his share of the work would not only be protecting his neighbours from the effect of his neglect, but would be forcing the defaulter to do what would turn to his own advantage.

I. RABBIT-PROOF FENCING.

If the wire-netting is to be attached to a fence already erected, too great care cannot be bestowed in seeing that it is really a sufficient one and in good repair, and will carry the netting securely for a good many years, otherwise, not only will the fence be insecure, and admit the rabbits, but the owners, who are responsible for its maintenance, will be put to considerable expense, which greater care at first would have saved.

The greatest care is also necessary in the erection of the gates in the rabbit fences to make them very convenient, easily opened and closed, and thoroughly rabbit-proof when they are closed, especially where the public possess the right of using them. Where there is much traffic it would be a wise thing to do to erect a small self-shutting gate, say 4 feet wide, through which people on horse-back and on foot could pass, and save opening the larger gate, generally a double one, for vehicular traffic.

Where an entirely new fence is to be erected, the posts should be very substantial, and the fence otherwise strong, of, say, four wires—top No. 8 gauge, other three No. 10, with proper spaces between the wires, to which wire-netting, 42 inch wide and 17 gauge, with $1\frac{1}{2}$ inch mesh, should be securely fastened, and the netting should be sunk 6 inches in the ground.

The cost of wire-netting a standing fence in good repair might be put at per mile, £35 to £40.

The cost of a substantial completely new rabbit fence would be about per mile, £60 to £70.

It is to be noticed that a wire-netted rabbit fence is the most secure cross-bred sheep fence which can be put up, when properly constructed.

II. POISON.

I. Phosphorus.

This is no doubt the best poison to use. It is not expensive—it is easily prepared for laying with cheap and convenient mediums. Rabbits will take it very readily (in fact all animals will, and this has to be kept in view in using it, lest the stock get access to the baits or the dead rabbits, bits of which they chew) and while the phosphorised medium is fatal to the rabbits that eat it, it does not kill so suddenly as to frighten the others from taking it. The mediums in which phosphorus is laid are pollard and grain, and of the two pollard is found to be the more enticing and effective.

SHOULD CARBON BE USED IN PHOSPHORISING POLLARD AND GRAIN?

There is no doubt that the use of bisulphide of carbon insures the thorough dissolving of the phosphorus, and by doing so gives a guarantee that the phosphorised pollard will not ignite the pasture. Experience has proved that if the necessary care is bestowed in dissolving this poison without carbon, as here directed, there is no danger of the phosphorised pollard setting fire to the grass, but there is always a risk that the necessary care may not be given, and the safer way would be to use the carbon during the season of the year when there was any risk of bush fires.

That the use of carbon in dissolving the phosphorus is thoroughly effective, there can be no question, for in a good many cases during the past extremely dry summer phosphorised pollard, prepared with carbon has been laid where the grass was long and dry without igniting it, and for that and other reasons carbon should always be used in preparing the phosphorised pollard and grain where it can be obtained.

(IA.) HAND-LAID PHOSPHORISED POLLARD (WITH CARBON).

The following recipe for preparing phosphorised pollard with carbon, given by Mr. Inspector Dowling, Forbes, has, during the last summer, been used with marked success in that and other districts:—

Put two tablespoonfuls of bisulphide of carbon in a pickle bottle, half fill with water, then break under water and add to same two sticks of phosphorus. Allow to stand over night. In the morning put 2 gallons of cold water in a tub, adding from 2 to 3 pints of molasses, or from 3 to 5 lb. of sugar (molasses is the more enticing), carefully dissolved; then, after seeing that the phosphorus is thoroughly dissolved, add contents of pickle bottle and stir the whole well. Add pollard gradually, and keep stirring with a stick until the mixture becomes too thick; then use hands and mix until it becomes a thick dough. The mixture is then ready for use at any time.

To avoid all risk in breaking the phosphorus it could be put in a square tin, with sufficient water to cover it, where it could be broken with a chisel, and then put into the pickle bottle, to be

treated as here directed. (*See* also general directions and cautions *re* keeping, carrying, and mixing of phosphorous, pages 111 and 112.)

N.B.—Carbon has to be carried, kept, and handled with care. (*See* Fumigation, page 125.)

(1B.) HAND-LAID PHOSPHORISED POLLARD (WITHOUT CARBON.)

Boil 1 gallon of water in an oil drum, 3-gallon bucket, pot, or other vessel, in which there is ample room to stir without splashing over, and have a bucket with water by you. Then take the vessel off the fire, and put at once into the boiling water two sticks (4 oz.) of phosphorus. Stir briskly for five minutes, and until it is thoroughly dissolved. Then carefully dissolve and add 12 lb. of sugar, or 3 pints of molasses, and well stir again. Then take the mixture off the fire, add the other gallon of cold water, and keep thoroughly stirring and adding pollard in small quantities till it comes to the constituency of thick dough. The stirring must be continued until the mixing of the bait is completed. If proper care be taken there is no danger in preparing the mixture, nor of it setting the pasture alight when it is laid, if the phosphorus is thoroughly dissolved. (*See* also general directions and cautions *re* keeping, carrying, and mixing of phosphorus, page 111.)

N.B.—The above quantities will give 50 lb. of made material, sufficient to poison 5,000 rabbits, at a cost of 6s. 4d., made up as follows:—20 lb. of pollard, 1s. ; 12 lb. of sugar, 3s. ; two sticks of phosphorus, 2s 4d. ; total, 6s. 4d. ; and will dress 500 acres of infested land.

(2) PHOSPHORISED GRAIN.

Phosphorised Oats or Wheat.

Thirty pounds of best plump oats or wheat, 2 gallons of water, and $\frac{1}{4}$ lb. (two sticks) phosphorus. Place the grain in a revolving machine or churn ; light a fire close at hand, upon which place two buckets, with 1 gallon of water in each. When the water boils, put $\frac{1}{4}$ lb. (two sticks) of phosphorus into one of the buckets, and stir slowly for five minutes until the phosphorus is dissolved. Pour this mixture into the machine, and add water from the other bucket as quickly as possible. Close the lid and turn machine slowly for about twenty minutes. If the machine has not then cooled sufficiently to allow the hand to be placed upon it without burning pour a bucket of water over it and turn for a few minutes. The machine should be turned for five minutes four hours after mixing, and also again for the same time eight or nine hours afterwards. In twenty-four hours the mixture should be taken out and spread at once. Give machine a few turns before taking oats out.

NOTE.—The mixing should not be done in an open boiler, as the phosphorus cannot be incorporated with sufficient quickness and evenness, and the phosphorous generally runs to the bottom. A revolving machine should in all cases be used, and to ensure the retention of the phosphorus in the grain it is a good thing to add a

pound of starch to each bushel, or coat it with pollard as directed (page 114). For laying, see "Laying by hand" (page 115).

Phosphorised oats prepared by this method are deadly for at least two months in winter after they are laid on the ground (the grain being permeated with the poison), and have proved deadly after ten days' exposure to warm rains and hot winds. Good wheat or oats, good phosphorous, and strict attention to the directions are, however, necessary to insure success.

Grain as a medium is less attractive and not so cheap as pollard; but there are times when a change of medium is called for, and then grain should be tried. Properly prepared and laid grain is not very expensive.

It will be observed that in order that the phosphorous may be thoroughly mixed with and absorbed by the grain (wheat or oats principally) the directions here given require that a revolving machine be provided, and as this would be beyond the means of the individual owners of the smaller holdings, they could provide themselves with small circular churns, which do not cost more than 20s. or 30s. They have been used for the purpose, and found to suit where the quantity of grain required was small, and they would also answer for the various mediums which are used with arsenic.

(3.) KEEPING AND CARRIAGE OF PHOSPHORUS.

Keeping of Phosphorous.

Great care should be exercised in keeping the phosphorus. Neither this or any other poison should be kept in a dwelling-house, nor in the general store of the station or homestead. It should be kept in a detached shed under lock and key, accessible only to owners or their managers, or other responsible persons. As to phosphorous it should be placed safely under ground. A good plan is to dig a hole in the clay floor of the dépôt, place a tub filled with water in the hole, and put the original packages into the tub, keeping a 10-lb. tin for immediate use in an oil-can, which should be also filled up with water, and kept in a secure place. The hole in the ground should be carefully covered over.

When requiring phosphorus for mixing, a small tin billy with water in it should be taken to the dépôt; then put the required quantity into the billy, and take it to the mixing place. *The phosphorus must be always in water*; and if a stick of it has to be divided, it should be cut under water. In hot weather it must not be held in the fingers more than a second or two. It goes into a flame at a temperature of, say, 100 degrees Fah.; and if dropped from a height on to boards or other hard substances it ignites. It will do so also if struck by a hammer. If it ignites accidentally, salt or sand will deaden it out; cold water thrown on will scatter the phosphorus about. It will burn and sparkle a little in the water, but soon congeals.

Carriage of Phosphorus.

Sometimes phosphorus is carried on horseback in fruit bottles. In that case the bung should be put half an inch down in the neck

of the bottle, and then filled to the top with wax. It is then safe to carry.

Phosphorised grain, properly mixed in a machine, is quite safe to carry in a double bag ; but it is better carried when in small quantities in a tin, and in large quantities in a box.

Phosphorised pollard should always be carried in a tin or box.

(4.) MIXING OF PHOSPHORUS, AND CAUTIONS TO BE OBSERVED IN MIXING AND LAYING.

Any intelligent man could be taught to handle phosphorus, and prepare phosphorised baits without carbon with safety in two lessons. Like everything else, however, this requires judgment and care. If the phosphorus is dissolved without the carbon, the person doing so should keep to windward of the fumes while preparing the baits : if he does happen to inhale a little it will not hurt him. They should be prepared in the open air.

The risk in using the phosphorus in this way is slight, but lest ordinary care is not bestowed, the following detailed directions are here given, which will apply where phosphorus is dissolved without carbon, whatever the medium may be which is used.

Take two 3-gallon buckets, and before commencing to prepare the mixture see that they are quite clean. Then have a supply of cold water within reach ; put the proper quantity of water (say 1 gallon in one of the buckets, and $\frac{1}{2}$ gallon in the other). Start the fire, and place the pollard or grain and phosphorus ready to hand. Put the buckets on the fire, and as the water in the bucket with 1 gallon boils, take it off the fire, break as directed, and put the phosphorus in the water, and stir quickly. At that temperature the phosphorus, with constant quick stirring, will be disseminated throughout the water in about five minutes. The person mixing should be provided with a stick 4 feet long, with a flat point to lift the bucket off the fire, and to stir the mixture.

Then, in the second bucket, with the $\frac{1}{2}$ gallon of water, put the sugar or molasses, and when thoroughly dissolved add to the dissolved phosphorus, together with, say, $\frac{1}{2}$ gallon cold water, and stir thoroughly. Then add pollard in small quantities. The safer course would, however, be, where the pasture will burn, to not adopt the mode here described of dissolving the phosphorus, but to use carbon, and only dispense with that chemical when the grass is green.

2a. Arsenic Dry.

(1.) IN POLLARD.

2 lb. arsenic (which should always be powdered), 10 lb. pollard, 2 lb. bran, 2 pints of treacle or honey, or 5 lb. sugar.

Carefully dissolve the treacle, honey, or sugar in 1 gallon of hot water and thoroughly mix the arsenic dry with the pollard and bran. This would be best done with a revolving machine or churn, as suggested in Phosphorising Grain, page 115. Then take up the mixture of arsenic, pollard, and bran in small handfuls and drop it slowly into the water, carefully stirring all the time, till the mass

comes to the consistency of thick dough, when, after it has been well kneaded, it can be laid either through a pollard distributing machine, or, if it be put out by hand, it should be rolled out and cut up, as described under "rolling-out" in laying phosphorised pollard by hand. (See page 115.)

(2.) GRAIN POISONED WITH DRY ARSENIC.

Fifty lb. of any grain of good quality, 2 lb. of arsenic, 4 lb. of brown sugar, and $1\frac{1}{2}$ gallons of water. Put the grain into a tub or boiler; boil the water in a bucket and dissolve sugar in same; pour the mixture over the grain in the boiler and mix, using a shovel for the purpose; then sift the arsenic on with a dredger, or by such means as will thoroughly disseminate the arsenic through the mass; keep stirring with the shovel until the whole is thoroughly mixed. In this case also the mixing could be more thoroughly done with a machine or churn. This poison should be prepared in the afternoon and used three or four hours after mixing, as rabbits will not eat anything sour or musty.

(3.) CHAFF POISONED WITH DRY ARSENIC.

Thirty lb. best green chaff, 2 lb. arsenic, 3 lb. sugar, and 1 gallon water. Obtain a large zinc-lined case and spread about 10 or 12 lb. chaff evenly at the bottom; boil the water and mix sugar in it; then sprinkle the water over the chaff and shake in the arsenic in pepper-box fashion and mix thoroughly. So in this case, too, the mixing should be with a machine or churn. It is only necessary to damp the chaff sufficiently to make the arsenic adhere to it. This mixture on being prepared should be spread at once and dried, as rabbits will not eat poisoned food which has changed its natural appearance from fermentation or any other cause.

In this way also such mediums as bran, hay, cut chaff, end cut sorghum can be poisoned with arsenic and laid. But it is only in poison yards or in paddocks from which the stock have been removed, that such poisoned mediums as these can be safely used.

(4.) CARROTS, APPLES, &c., POISONED WITH DRY ARSENIC.

Twenty lb. of apples, pumpkins, or carrots, cut in small pieces (about $\frac{1}{2}$ inch square) and 1 lb. arsenic.

Sift the arsenic on dry with a dredger.

When using carrots it is advisable to lightly damp them in a thick solution of sugar. With apples this is not necessary, as there is sufficient acid in the apples to absorb the poison. Here also the machine or churn should be used; but it should be so very gently and slowly.

NOTE.—In connection with the poisoning of carrots and apples with either arsenic or strychnine, it is very advisable to lay the apples or carrots without any poison on them a few times before the actual poison is put out, so that the rabbits may get used to and acquire a taste for the bait.

This course has been found to be most successful, specially as regards apples, and should be followed in laying all kinds of medium.

2b. Arsenic in Solution.

(1.) GRAIN, &c., WITH ARSENIC IN SOLUTION.

Half-pound arsenic to 2 gallons of water ; boil until there is only 1 gallon left; then pour in 2 lb. of common sugar and 25 lb. of oats or wheat ; stir it about until the mixture is absorbed, then cover it over until cold before you lay it out.

(2.) BRAN, CHAFF, &c., WITH ARSENIC IN SOLUTION.

In this way also such mediums as bran, hay, ensilage, cut chaff, and cut sorghum can be poisoned with arsenic and laid.

(3.) CARROTS, APPLES, &c., WITH ARSENIC IN SOLUTION.

Arsenic is the best poison for carrots (the most enticing medium of all) and they are prepared in much the same way, except that they should be only parboiled, and should have a thin coating of pollard sifted over them. Owners in the infested districts, who have appliances for watering their gardens, should grow quantities of carrots for this purpose.

(4.) COATING OF POLLARD ON MEDIUMS POISONED WITH ARSENIC.

In hand laying, after the poison and medium have been thoroughly mixed and the mixture prepared for laying, a coating of pollard might be added to assist in retaining the poison, and to complete the preparation the mixture should be carefully dried in the sun, in order to prevent it from moulding and spoiling after it is laid. With the same view the poison should, as far as possible, be protected from the rain, dew, and damp when laid.

(5.) ARSENIC IN WATER.

Water poisoned with arsenic is also an effective medium under certain circumstances. (See "poisoned water," page 119.)

3. Strychnine.

(1.) POISONED JAM.

Jam is a medium of which the rabbits are very fond. It can be made from almost any fruit—apples, quinces, or if these are not procurable, even from pumpkin or pie melon. To prepare the jam, chop up the fruit into pieces half an inch square, skins, seeds, and all, and boil with half their weight of sugar, until a thick jam is obtained. Care must be taken to keep it constantly stirred while boiling, as rabbits will not touch it if burned.

When the jam is made, add strychnine at the rate of 1 oz. to 25 lb of jam and mix thoroughly. The strychnine may be either dissolved in acid or simply powdered fine. Arsenic may be used instead of strychnine—it is cheaper, but the results are not so good.

The method of laying the jam is to turn up a sod and place a piece the size of a pigeon's egg on it. Six or eight lumps 10 or 12 yards apart should be put down in patches near the buck heaps, 100 yards between patches. The jam should be laid on chips, or small pieces of bark, so that what is not used can be lifted and relaid.

Sheep, cattle, and horses will not touch jam.

(2.) CARROTS, APPLES, &C., AND STRYCHNINE.

Twelve or 14 lb. of apples or carrots cut into small pieces and sprinkled with 1 oz. powdered strychnine. Lay pieces in a ploughed furrow 10 or 20 feet apart.

(3.) TWIGS POISONED WITH STRYCHNINE.

There are two methods:—

- (a) Dissolve $1\frac{1}{2}$ oz. of strychnine in 1 quart of vinegar, or of this quantity of ascetic acid; then add this to 5 gallons of water; add 2 lb. of flour and 1 lb. of sugar to form a thin paste; or
- (b) Use $1\frac{1}{2}$ oz. of strychnine to 1 gallon of water, and 2 lb. of flour and 1 lb. of sugar to make a thin paste. In this case the strychnine should be ground between two pieces of glass before being placed in the water, as otherwise it will not be held in solution.

This mixture is applied to the twigs of the sandal-wood, hop, or other bushes that stock eat, either by means of a brush or by dipping them into the solution.

It is not considered safe to lay these twigs and leaves, except in poison-yards, or in paddocks from which the stock have been removed.

(4.) WATER AND STRYCHNINE.

Water poisoned with strychnine is also an effective medium; but arsenic is generally preferred. (See poisoned water, page 119.)

4. Preparing Poisoned Medium for Laying.

(1.) BY HAND.

Rolling out.—Have a clean board and a roller, and keep them well dusted with dry pollard. Take about two handfuls of the dough out with a flat stick, throw dry pollard on it to stop any sparkling, knead it well by hand, and roll out to $\frac{1}{4}$ -inch thick. Cut the cake so as to divide it into $\frac{1}{4}$ -inch squares, and throw the ragged edges back in the pot. Gather up the squares with the dry pollard, &c., and place in a box with more dry pollard.

Great care should be taken to give the rabbits tasty and clean food, as little changed from its natural condition as possible, as they are cleanly, and keen to detect any suspicious appearances surrounding the food spread for them.

Stock, especially if cross-bred sheep, should, where practicable, be removed from the paddock before the poison is laid; but if the pellets of phosphorised or arsenical pollard are not too large (say not bigger than $\frac{1}{4}$ -inch square), and if they are laid in very narrow furrows, about 3 inches deep and from 3 to 5 yards apart, and if the poisoned grain be put out in single grains about 2 yards apart, it is found from experience that the losses from merino sheep taking the poison are very light, if any, especially where the baits are dropped right in the bottom of the furrow.

Various methods are adopted in different parts of the country in laying poison; but it has always been found that the rabbits take it much more readily where the soil is freshly turned up, as they are always attracted to where the earth has been recently disturbed.

Where the nature of the country will not permit of the use of a plough or poison-distributing machine the soil should be upturned by some other means, viz., with a hoe; sledge, old adze, spade, or any other handy implement, and the poison laid at the bottom of the scratch or small furrow thus made.

It is not a good plan to lay poison too near the burrows; but it should be put down freely in other localities likely to be frequented by the rabbits in furrows from one to three chains apart, while a furrow should be drawn right round the paddock, and properly poisoned. In ploughing where there are rabbits, the bottom of the last furrow should always be poisoned before quitting the field at night,

The fresher and softer the mixture is, the more likely the baits are to be taken; and if in any case they have become dried up, or there is a risk of their becoming so, they might be remoistened in a damp cloth, or carefully sprayed and recovered with dry pollard before being laid.

If this can be successfully done it will be possible to establish a system under which the Boards could arrange for the poisoned medium being prepared at convenient centres in their districts, and distributed at prime cost for laying to those owners who are disinclined to prepare the medium themselves. It will be seen that such a system would not only get rid of nearly all the risk and trouble which the handling and mixing of the poison would entail, but the baits would be better prepared and cost less than if owners purchased the poison and prepared it themselves for laying.

It would be best, in putting out the poison, to lay the whole of the paddock in one day; but if this cannot be done the limits laid should be noticed, and next day the laying should be continued until the paddock is finished. Do not disturb the rabbits by going over the first poisoned ground until the third or fourth day after.

Although a grass paddock, if it is not closely stocked, can be cleared of rabbits before removing the sheep, if the poison has been carefully prepared and the baits are the right size, and are laid at proper intervals—the stock should, where practicable, be always removed before the poison is laid. Where this cannot be done, when laying by hand it would be found better to lay the baits at the foot of hedges, under logs and under log fences, or under any natural or artificial cover from the stock, or what would be better still, in poison yards, the description and use of which are afterwards given.

When the stock are removed the paddocks could then be thoroughly poisoned, and after a lapse of about three weeks or a month the stock could be put back without risk, while the paddocks would in the meantime be spelling, so far as the pasture is concerned, and thus owners would have suffered little or no loss by the temporary removal of the stock.

If the paddocks cannot be kept without stock for the time mentioned, and perhaps in any case, if it can be done, the furrows should be systematically followed, after (say) the fifth or sixth day, and the baits either picked up or well covered with soil.

The best time for poisoning is in the summer months, when the grass is dry and feed scarce; although by changing the bait and with careful attention to local conditions, poison may be laid with good results for the greater part of the year. This is especially the case with poisoned pollard.

It is usual to allow an interval of about four weeks between each poisoning, when the bait should be changed. But experience will show whether successful poisonings can be instituted at shorter intervals, according to the season, class of country to be operated upon, and a variety of poisons.

When a fresh medium is to be used and the area to be poisoned small, it will frequently be found advisable to put it out, in the first instance for several nights in an unpoisoned state, in order to gain the confidence of the rabbits, and only to lay it poisoned in the right quantity as directed, when it is seen by the way in which the unpoisoned medium is taken that the rabbits are frequenting the place.

(2.) POISON YARDS.

Where the country is too mountainous or rocky, or heavily timbered or scrubby, or otherwise of such a description that distributing machines cannot be used for laying the poisoned medium, or where the stock cannot be removed from the paddock before the poison is put out, or on Travelling Stock Reserves, these yards in which it can be laid without any risk of the stock getting access to it should be erected wherever signs of rabbits are noticed, at such distances apart as the prevalence of the pest and the circumstances call for. They can be of any size or shape and of any material so long as they are so constructed that they will allow the rabbits free ingress and egress, but prevent sheep or lambs from entering, and are sufficiently high and strong to stop large stock from getting at the poisoned bait over the top of the fencing.

The least expensive one would be a small yard of four panel, 8 feet square, or a still less expensive triangular one of three panels.

In order to protect the bait from both sun and wet as well as from the birds, the yard should be covered with brush; but plenty of light should be left underneath the covering.

The yards should be erected a week or more before the poison is laid, so as not to arouse the rabbits' suspicions, and it would be better still if they were fed as already suggested for a few days with the medium in an unpoisoned state in and around the yard till their confidence is gained and it was seen that they took it freely, when that carrying the poison could be laid in such quantities as was considered advisable, looking at the extent to which the unpoisoned medium is taken. When laid the yards should be seen daily, and, where necessary, additions should be made to the poisoned medium.

When it is noticed that the rabbits refuse to take the phosphorised pollard, it could be taken clean away, the yard left without poison for a week or so, and then a fresh medium laid, in the first instance unpoisoned and afterwards poisoned as directed.

The unpoisoned medium should be laid in short furrows converging to the poison-yard.

Chaff should be laid in these yards, in a hole of about 10 or 12 inches long, and 5 or 6 inches wide, and 3 or 4 inches deep, to prevent the wind from blowing it away.

Poison-yards are advantageous in a great many ways—

- (1.) They are very inexpensive.
- (2.) If properly constructed, it will be long before they need to be renewed.
- (3.) They would answer anywhere, but especially where a machine cannot be used, and are a great assistance where the poison has to be laid by hand.
- (4.) Mediums which are very enticing to the rabbits, but which cannot be laid in the open, where sheep are depasturing, can be so in any quantity, and as frequently as necessary in these yards.
- (5.) The poison-yard greatly reduces the trouble and expense of laying poison.
- (6.) By laying the baits in poison yards there would be no losses of stock.
- (7.) A system of poison-yards would greatly facilitate inspection and the enforcement of the law, as all the inspector would have to do would be to see whether the yards were supplied with baits.
- (8.) By laying in poison-yards the baits are protected from the sun, and are therefore kept moist and soft.

(3.) LAYING POISON BY MACHINE.

The directions already given for the preparation of hand-laid phosphorised pollard will apply in its mixture for machine laying. The principal question as to its mixture for that mode of laying will be its consistency, and with respect to that again, as the mode of delivery of the different machines is different, the owner will have to be guided by the directions given by the manufacturer of the machine he purchases.

In selecting a machine for laying poison for rabbits, the purchaser will have to bear in mind the nature of the country in which it is to be laid—*i.e.*, whether it is level or hilly, sound or broken, timbered or clear—and to select a distributor which will suit his country.

The following is a list of some of the machines offered for sale:—“Pearson’s” Pollard Distributor, “Gunn’s,” “Ringer,” “Ferrier’s” and “Simplicity.”

5. General Remarks and Cautions re Poisoning.

The fresher the baits the more likely they are to be taken.

As to the results, owners must not think because the oat poison is not touched for two or three days that it is useless; rabbits, unless they are starving, rarely touch it till it has lain two days on the ground, and in the summer time still longer.

Rhodum.—Rhodium has been used to induce the rabbits to take the poisoned grain, but it is too expensive in a general way.

The rhodium, 1 oz. to the 100 lb. of grain, is added after the mixture has cooled, and just before it is laid out.

Poisoning should be followed up by digging out the burrows and destroying all harbor and cover, such as log, brush, and stone fences, dead timber, &c.; in fact, it has been found by the holders of large estates in the Western District of Victoria that this is the only effectual means of getting thoroughly rid of the pest.

In every case of laying poison by hand a spoon or some other vehicle should be used, in order to avoid touching it with the hands, as the rabbits have a very keen sense of smell, and will avoid baits with respect to which they can smell human contact. Sprinkle the baits, as in sowing, on the ground which has been upturned.

It is the opinion of those who have used both sugar and treacle, that rabbits prefer baits sweetened with treacle to those sweetened with sugar, and treacle is the cheaper of the two.

III. TRAPS.

1. Poisoned Water and Water Trapping.

POISONED WATER.

Poisoned water and water trapping have, in the dry portions of the State, been among the most effective methods of destroying rabbits. Of the two, water-poisoning is the least expensive and more certain means of their destruction. While this is the case, there is always a certain amount of risk of stock or other animals getting at the poisoned water, which leads the majority of owners in the Central Land Division to use the water-traps in preference to poison water. In the Western Division again the risk is not so great, and the poisoned water is there generally used.

Large numbers of the watering-places on the holdings in the dry portions of the State are now fitted with these appliances, by which millions of rabbits have been destroyed, and if this course were universally taken in the dry country, as it should be where the stock water at tanks, wells, and other places, which can be effectually enclosed, these methods would be of the greatest possible assistance in keeping the pest under control.

It will be seen that these enclosures and traps might, in some cases, be utilised in other than times of drought, and when there was no scarcity of water, by baiting them with food, of which the rabbits are fond.

Under both these methods, when put in practice, the stock would be excluded from the water at night, and admitted during the day.

POISONED WATER.

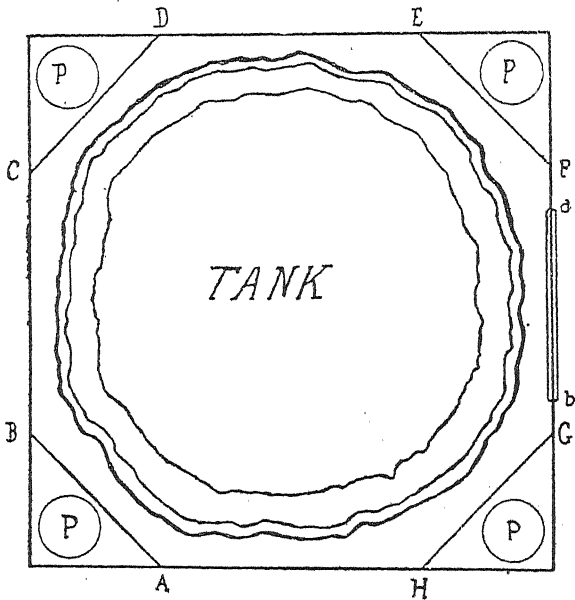
Water poisoned with arsenic.

Two ounces arsenic, 4 ounces washing-soda, 1 gallon water. Boil till arsenic is dissolved (about half an hour). When cooling, add 2 ounces sugar, and stir well. For use, add 2 gallons water.

Water poisoned with strychnine.

- (a) One ounce strychnine dissolved in a third of a pint of acetic acid will poison 12 gallons of water, or
- (b) Ten grains dissolved in vinegar will poison 1 quart of water.

(I.)—SKETCH AND DESCRIPTION OF AN ENCLOSURE FOR WATER POISONING.

*Directions for using Poisoned Water.*

Securely enclose with one and a half widths of wire-netting the tank, well, or other watering-place close up to the water, but leaving sufficient room for the stock to enter and drink, and excluding also the four corners, as shown on the sketch by letters "A B," "C D," "E F," and "G H." Then make a small hole, in the form of a large milk-dish, as shown by letter "P," in at least two of the corners, at a safe distance from the netting, sufficient to hold five or six buckets of water, and then erect on the outside of each of the corners a very substantial secure stock and rabbit-proof fence with not less than a width and a half of wire-netting, in which an opening, sufficient to admit rabbits but not sheep or lambs, should be left.

The gates for admitting the stock to water could be put up at, say, from *a* to *b* on the sketch, or wherever it was most convenient.

2. Water Traps.

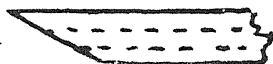
In all water traps the wire netting should be $1\frac{1}{4}$ -inch mesh and 17 gauge, and the fences of the tank and forcing yards should be constructed with not less than $1\frac{1}{4}$ widths of 3 ft. 6 in. netting, making 5 ft. 3 in., of which 1 ft. should be sunk in the ground and 9 inches turned in at the top at an angle of about 45 degrees as a cap, to ensure that the rabbits do not climb up and out. This leaves the fence 3 ft. 6 in. in height. The killing yards should be

either roofed in with netting or have fences of two widths in netting, *i.e.*, 7 ft., of which 1 ft. should be sunk in the ground, and 15 in. turned in at the top to form a cap as described. The wings should be of the ordinary height and construction of a rabbit fence.

The holes through which the rabbits pass are, as a rule, either needle or spiked funnels, properly made and fitted into the fence.

Another form of entrance is sometimes used: A hollow log with the end inside the fence cut off on the under side at an angle

of about 30 degrees (thus—

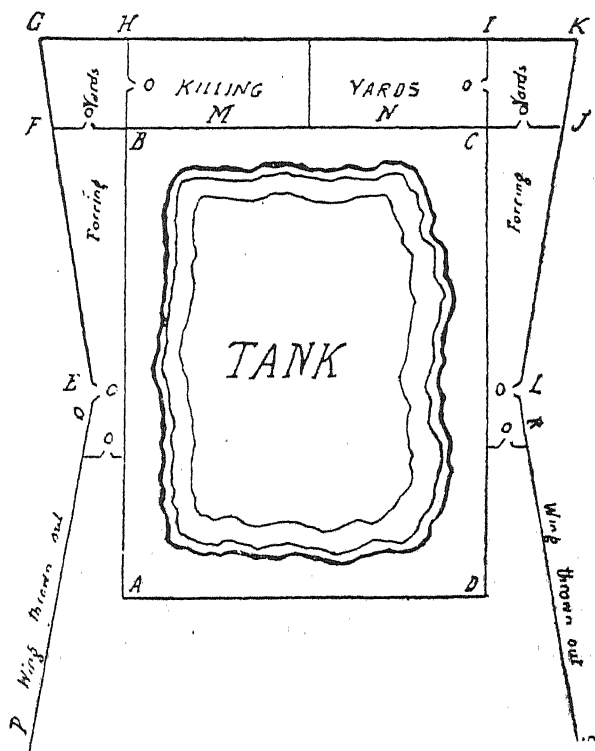


) is put into

the fence instead of a needle arch, and a hole dug inside the trap yard 2 ft. deep, 4 ft. wide, and 7 or 8 ft. long in a line with the log, and over this hole the log projects about 18 in. With this excavation, and the shape of the outlet of the log, the rabbit, even if it were to jump at the outlet, could not obtain a foothold, and must fall into the trap.

The following are sketches and descriptions of some of the water traps which have been used with good results.

(1.) WATER TRAP AT ENCLOSED TANK.

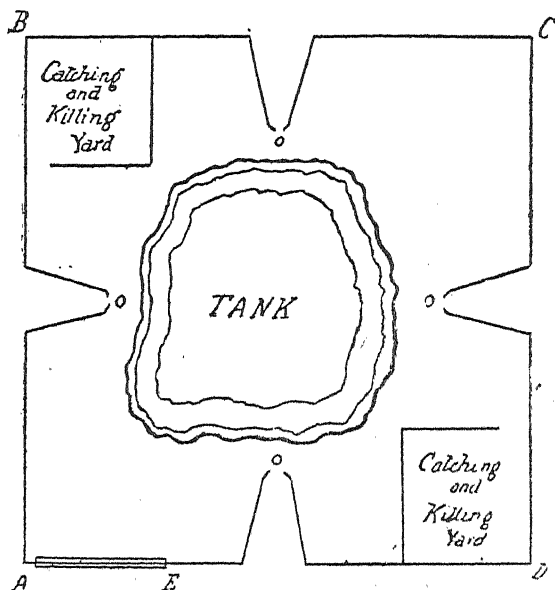


The sketch shows the fencing A, B, C, D, enclosing the tank—the forcing yards on the one side E, F, G, H, and I, J, K, L on the other; M and N the two killing yards; O, the needle arches or spiked funnels, and P Q and R S the wings.

A sufficient portion of the side A to D should be made so as to be easily taken down in the day time to water stock, and to be securely replaced at night time when rabbits always water. It should, of course, be rabbit-proof, and should be carefully made and fitted, as it is to be put up and down daily, while trapping goes on.

(2.) WATER TRAP AT OPEN TANK.

This is very much more easily constructed and less expensive trap than number 1, and if it proves equally effective, will take its place; but very great care should be taken to see that the fences are of the proper height, and that they, as well as the entrances and gates, are all thoroughly secure, and that the necessary capping is provided and properly adjusted on the fences.



Sides A B, B C, C D, and D A, are wire-netting, with entrances at the points in the sides marked "O," fitted with needle arches or spiked funnels, as already described.

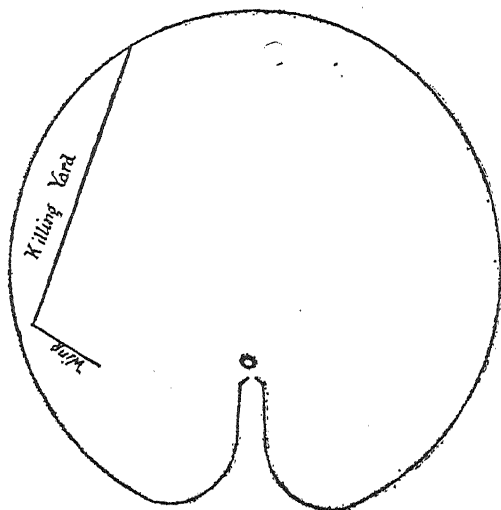
Gates of the necessary description and size to allow the stock to water in the day-time should be made as marked at A to E, or any other suitable part of the fence.

(3.) WATER TRAP.

As will be seen from the diagram, this trap is in the form of a circle, with a small lane leading into the needle arch or spiked funnel. The circular form is an advantage where the trap is made

on the movable principle, which it has been in several cases, and caught large numbers of rabbits. In this form it can be easily and quickly erected or taken down and removed to a fresh watering place; but great care should be taken that the netting is of sufficient height, that it is sunk, say 9 inches in the ground, and otherwise thoroughly secure, as rabbits are extremely difficult to keep, especially where they are confined in large numbers.

It is constructed by driving stakes at short distances apart into the ground and sinking the netting to the depth mentioned. The fence should be capped at least at every stake.

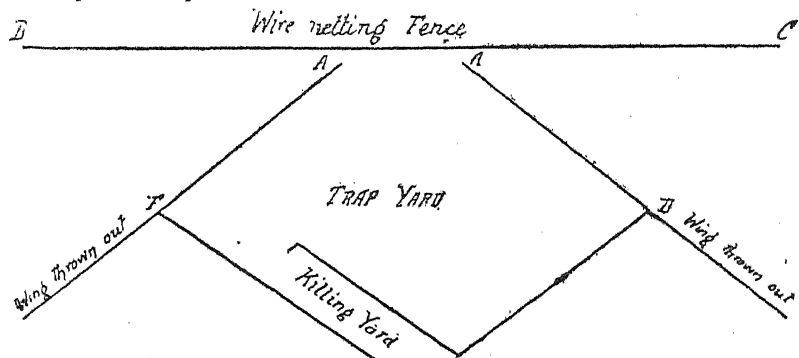


Rabbits striking the netting anywhere will follow it for an opening, and find it at "O."

3. Yard and Tip Traps on Wire-netted Rabbit Fences.

(1.) YARD TRAP.

This trap is erected on a rabbit-proof fence, as rabbits have a habit of travelling along fences. This fact is also made use of in the pit-fall trap described next.



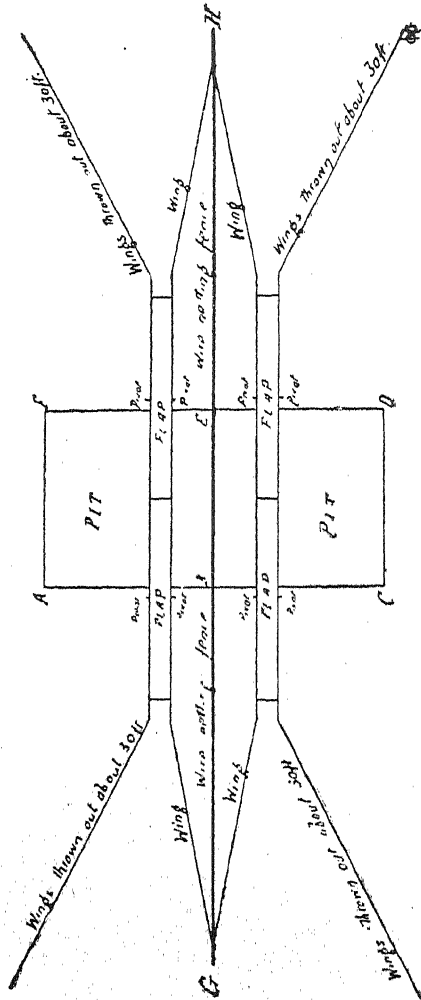
B C is the wire-netting boundary fence.

A convenient size for the trap is to make the sides FE, ED, and FA and DA to where they join the netted fence at A and A, about 20 feet long.

It is a good plan to throw wings out about 30 feet beyond the yard and leading to the needle arches.

(2.) FALL-PIT OR TIP-TRAP.

The fall or tip-trap is the most extensively used, and the most constantly successful trap that has been tried so far ; and, when



constructed in a sufficiently large number of places, catches an immense number of rabbits. Well and strongly made it will last for years, and being self-acting is always ready.

The pit for the trap A B C D E F should be about 4 feet deep, 4 feet wide, and about 8 feet long—4 feet on either side of the fence G H ; and should be lined with netting or logs to prevent burrowing, and also should be closely covered with timber.

The flaps (of which there are two each side of the fence) should be about 4 feet long and 6 inches wide, and should fit closely ; but not so as to jam. They should be balanced on their pivots—which may be of light iron, resting in auger holes in a wooden frame—that when at rest they form a level track. Supported at the end away from the pit, the flap tips only when the rabbit arrives over the hole, and so throws it into the trap, and then falls back to original position.

Flaps made of thin iron give the best results, as they are not affected by the weather which causes wood to swell and warp.

The trap should be regularly visited and cleared. If the rabbits were left to die and decompose, others would be likely to avoid it.

IV. FUMIGATION.

1. Bisulphide of Carbon.

Bi-sulphate of carbon is by far the cheapest and most effective agent for dealing with rabbits in burrows, bilbee holes, and warrens. It costs 6d. per lb., and can be safely and effectually used in the following manner :—Get two common tea billies, one 4 quarts and one 6 quarts ; the lids must, of course, fit properly. Put a lining of cotton waste, tow, or old rags in the 6-quart billy ; then put the 4-quart billy inside of the 6-quart ; fill the smaller one with carbon, and you have a cheap and ready means of carrying it.

When you find a working burrow, two men go out, one carrying a spade and the other a supply of carbon. They break off a piece of stick about 3 or 4 feet long, and wind round the end of it a bit of cotton waste of the size of a small apple ; dip it into the carbon, thrust it as far into the burrow as possible ; close the entrance quickly with earth closely trampled into it, and your work is done.

If you find a large warren or bilbee hole with 15 or 20 entrances, close up all but the main ones, and those which you think are independent holes (by independent holes I mean those which from their appearance are leading away from the main burrow), leave about six in twenty to be carboned.

A warren with 20 entrances will take two men about 10 or 15 minutes. If the men are working in open plains where sticks cannot be got they should carry with them a long thin sharp-pointed stick to place and leave the carboned cotton waste in the burrow.

Carbon should be stored in a shed, or put in a hole underground, and covered over with boughs to keep it cool.

It can be used in all weathers, and in many descriptions of country, and never found to fail, if properly handled ; but it should be so under strict supervision, for it is very explosive. No fire must be allowed near it, either in carrying, using, or storing it. This must be kept constantly in mind.

Smoking or striking of matches should be strictly prohibited amongst the men when carbon is being carried or used, and its exposure to heat should be avoided. When using it care should also be taken not to inhale the fumes, as, though not readily fatal to man, it nevertheless depresses the vital powers, and may cause headache or vomiting. In handling it, the person doing so should always stand on the windward side of it.

V. DESTRUCTION OF RABBIT HARBOUR.

Where the land is infested with rabbits, and is of sufficient value, and the owner has the means, he can make no improvement which will have such a permanent effect on the suppression of the pest as clearing it of burrows, hollow logs, and scrub, and thus destroying all cover for the rabbits, for rabbits will not stop where they cannot obtain cover ; and, while clearing his land of rabbits, he also improves its carrying capacity.

REPLY TO RESOLUTION PASSED AT THE NINTH ANNUAL CONFERENCE OF PRODUCERS.

At the last Conference of Producers, held in March last, the following resolution was introduced by the Irishtown Farmers' Club :—" That in the opinion of this Conference the examination of boilers, used solely for agricultural purposes, once in every two years is ample, and that the Act be amended accordingly." With reference to this a reply has been received to the effect that the Hon. the Minister for Mines regrets he cannot see his way clear to amend the Act in the direction suggested. He has, however, given instructions to the officers charged with the administration of the Act to enforce it as leniently as possible, due care being taken that all necessary precautions with regard to safety are observed.

BARNYARD MANURE.—The subject of the value of the barnyard manure and the best methods of its treatment has long been a topic much discussed by farmers. Yet it seems manure is often thrown out of the stalls and left to lie in piles in the drip of the stable. It will heat and much of the ammonia will escape. When it rains the soluble fertiliser ingredients are washed out and lost. Manure treated in this way will lose at least one half of its value before it reaches the field.

AMATEUR WINE BOTTLING.

Bottled and cased wine for the market is often costly, the consumer having to pay besides bottles, corks, capsules, labels, and cases, the cost of the labour entailed by these operations. Wine bought in wood, on the other hand, often proves more costly still to those who, for want of experience, neglect or fail to observe, when handling it, ordinary precautions for its safe-keeping.

Wine in bulk and bought in cask is also cheaper than smaller quantities sold by the case. The wine-maker or the wine merchant generally allow the full amount for casks returned in good order, so that by buying his wine in bulk and seeing to the bottling himself, the consumer can stock his cellar with good sound wine at a small cost. Instead of paying 1s. 6d. or 2s. a bottle, or even more, he can lay down a stock of wine at a cost of 1s. a bottle, or little over.

A few notes on the question of the home-bottling of wine will enable a great many who begrudge the higher price to procure sound wine at a small cost and bottle and keep it until required for use. Instead of deteriorating, such wine keeps on improving when thus put away.

SELECTING WINE is the most important step of all, and in every instance it is advisable to sample the wine and ascertain whether it suits one's taste or requirements or not. It is always advisable to buy from a maker or merchant who understands his business, and it is cheaper to buy for a shilling more a gallon a wine which has been properly fermented and matured than a young wine, which may cost less but cannot be as wholesome. Young wines are still surcharged with carbonic acid gas, with cream of tartar, with dead cells of yeast and of other ferments, and with an excess of colouring matter, which make its use unpalatable as well as unwholesome. Such wines produce dizziness, headaches, they check digestion, and, worst of all, when taken in excess they lead to kidney troubles. Some constitutions can stand them better than others. When buying for immediate consumption, ask for a wine at least two or three years old, whether it is a wine of the claret, burgundy, chablis, port, or sherry type you require.

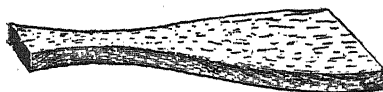
BE READY FOR BOTTLING.—The cask having reached the cellar, place it on a small stand, at a height of 15 to 18 inches from the ground. Collect bottles or buy them. For home use it is immaterial what shape or colour the bottles are. French claret bottles are expensive, but brandy or whisky bottles answer just as well, or even beer bottles. The bottles are easily cleaned. It often happens that they have a cork inside; this is easily removed by using a special cork drawer made of wires armed with a spike or hook at the end, and costing 1s. or thereabouts. The bottles are placed in soak in water containing a small handful of washing soda for each gallon; they are then cleaned of stains and crust by using small shot or coarse sand and water. It is important that no shot be left in the bottle, as the action of the acid in wine on the shot

would result in the wine containing in solution salts of lead, which are highly poisonous. When cleaned the bottles are rinsed in fresh water and placed in cases, in baskets, or on crates to drain.

CORKS are also required; these vary in texture and in shape, If a powerful corking machine is available a larger cork is preferable; if not tapered corks should be procured; they cost from 3s. to 4s. per gross. Beer corks, which are cheaper, are unsuitable; they are too porous, and are not lasting enough.

A SYPHON is much preferable than taps for drawing the wine from the cask and running it into the bottles. The best syphon is a flexible piece of indiarubber tubing about $\frac{3}{8}$ -inch inside diameter. Gas piping answers the purpose very well; two yards, costing 1s. 6d. a yard, are sufficient.

A CORKING MACHINE is very convenient. A good substitute is



Cork driver.



Hand-corking Tube.

a hand-corking tube, made of box wood, and costing only 2s. 6d., and a cork driver, made of a piece of board cut into shape as shown in the illustration.

MODUS OPERANDI.—It is supposed that the wine is bright and in good condition for bottling. If it is turbid and dull looking, write for information, or seek the advice of someone who knows how to handle wine. The cask has been allowed to rest on the stand, bung on top, for a week or so, and any sediment that may have been in it has settled into the bilge of the cask. Remove the wooden shive by hitting the top stave, in which the bung hole is bored on each side, alternately. This will start the shive, which will then be easily removed. If too tightly driven a wood chisel and a hammer will soon remove it, but the circular bung hole must not be damaged by the chisel, as this will make it difficult to bung it down again when used another time.

The clean bottles have all been arranged around the cask. The operator, after having run water in the indiarubber tubing to cleanse it, places one piece into the cask through the bung hole, as shown in the illustration, until he feels that the syphon touches the bottom of the cask. He then stands alongside the cask, holds the tube between the thumb and the forefinger, about the same height as the top of the cask, sucks only once, and promptly lowers his end of the tube. * If the suction has been properly applied no wine will be spilled, and it will run out at once. Half a glassful is collected, and if not clear and bright it is run into a jug until the clear wine comes out.

The thumb and forefinger compress the end of the tube, which is now placed just inside the neck of the bottle; the pressure is

relaxed, and when the wine rises to the middle of the neck of the bottle the rubber tube is pressed again, another bottle is filled, and so on until all the bottles are filled.

Six bottles will be necessary for every gallon of wine in the cask. If the syphoning has been well done there will not be more than a quart of wine left in the cask. Do not use a tap; wine is almost sure to be spilled unless it is cleverly fixed on, and it, moreover, damages the head of the cask.



CORKING.—Put the corks in a bucket of warm water; this will soften them and make it easier to drive them. If tapered corks are used they are simply fitted in the neck of the filled bottles and they are then driven in with the driver. If the corks are not tapered each one in turn is put in the chamber of the hand corking tube, which is then placed on neck of the bottle, and the pusher is then driven down by means of the driver or a wooden mallet.

It is advisable that the bottles be well filled, but plenty of room should be left for the cork or else the bottle might burst.

When filled lay the bottles in rows on the side, and note any which may be leaking at the cork. These put by for more immediate use; the others are slightly clipped at the neck in bottling wax, which may be bought at cork merchant's or at wholesale druggist's for a few pence per lb. Different colours, such as red, green, blue, or white, may be used for different wines. Care should be used in melting to keep the wax continually stirred to prevent it burning and assuming the appearance of a gritty deposit.

Wine thus bottled may be kept sound for years. It will greatly improve for keeping a few months before it is used.

INSECT PESTS.

CIRCULAR TO FRUITGROWERS.

The Secretary of the Department of Agriculture has caused a circular letter to be sent to all the Societies in the State, of which the following is a copy:—

"I beg to draw the attention of your Society to the recently amended regulations under 'The Insect Pests Amendment Act, 1898,' and more particularly to the new Regulation 20, governing the use of second-hand fruit cases, which reads as follows:—

"The use within the State of second-hand fruit cases or packages that may reasonably be supposed to have contained fruit is prohibited, and the Chief Inspector or Local Inspector may order the disinfection of same, as provided in Order II, or by any other means that may be directed by the Secretary of the Department of Agriculture, and failing such disinfection shall seize and destroy same.

"Experts are agreed that the use of second-hand fruit cases, without being disinfected, is one of the surest methods of disseminating disease. This being so, it behoves everyone interested in the horticultural advancement of the State to prevent the use of second-hand cases as far as possible, unless they have been previously disinfected.

"In accordance with the expressed desire of recent Producers' Conferences, this Department has, in order to discourage the use of second-hand cases, obtained the co-operation of the Railway Department in the matter of differential rates being levied on new cases (imported or locally made) and second-hand cases.

"The material for cases in shooks can be obtained in Perth, subject to slight market fluctuations, at the average price of 8s. 6d. per dozen.

"Not only is it in the interests of growers to discourage the use of second-hand cases, but also to encourage the use of an uniform case, and it stands to reason that, the contents being good, the more attractive the manner in which fruit is marketed the higher will be the returns.

"A new and uniform case, the distinctive individual brand of the shipper, an attractive address-label, and careful grading and packing, will secure a maximum return and drive the worthless fruit out of the market—it is carelessness and rubbishy fruit that

brings down the average—and, while ensuring to the grower a better profit, will also ensure to the consumer a cheaper, because a better, and a more regular supply of the best fruit.

“Now local growers have to compete against the Eastern States it is imperative they should attend carefully to details.

“No matter how careful the inspection at the port of entry, experts are of opinion that the danger of introducing diseases new to this State will always be present, and this knowledge should stimulate the local growers to exercise the greatest vigilance in preventing the possible introduction of diseases into their orchards.

“The saving of a penny or so per case, by using second-hand cases, may be the means of introducing into an orchard a disease that may cost hundreds of pounds to eradicate, if it does not finally render the orchard worthless.

“This Department, as you are doubtless aware, has only four Inspectors to supervise over four thousand widely-scattered orchards and vineyards, and I am appealing to your Society now to appoint from its membership, one or two, or three or more—as you may think fit—honorary inspectors, who will assist this Department in administering the Insect Pests Act. It is in your own interests I ask you to assist the Department. You have now to face the competition of the Eastern States in fruit and diseases, and you can only successfully do this by exercising eternal vigilance in keeping your orchards and vineyards free from disease, and the best way to do this is to follow the lines indicated:—

“1. Plant vigorously, but only the best varieties, having an eye always on the export trade of the future.

“2. Cultivate thoroughly and prune properly, and do not starve the trees if a little fertilizer will help them.

“3. Spray carefully and often, remembering that a single spraying is seldom of much use.

“4. Allow no second-hand cases to come on to your place. If they do, disinfect at once.

“5. In the interests of your neighbours send no second-hand cases away unless disinfected.

“6. Ship only the prime fruit, turning the rest into jam or pork. Either will pay you better than spoiling your own market by supplying rubbish. ‘It is an ill bird that fouls its own nest.’

“7. Pick, grade, and pack as if you were handling eggs, and use only new cases, branded with the name of the orchard, and legibly addressed on an attractive label, to your agent.

“If you decide to appoint honorary inspectors in the different centres of your district, as I hope you will, I will endeavour to secure them any actual out of pocket expenses they may incur in the execution of their duties.

“Remember ‘Eternal vigilance is the price of success.’

“I have the honor to be, Sir,

“Your obedient servant,

“L. LINDLEY-COWEN,

“Secretary.”

PRUNING.

By A. DESPEISSIS.

In previous chapters the general principles of pruning vines, and also fruit trees, have been dealt with. In this issue the consideration of the best ways of training and pruning a few more of the fruit trees generally cultivated in our orchards is proceeded with.

PRUNING THE CHERRY.

The instructions given about the shaping of young trees apply to the cherry. The stem should be low and headed back to 12 to 15 inches when planting; the main limbs are also cut short, as the tree is very subject to sunburn. To guard against this it is a good practice to pinch all side shoots not necessary for the extension of the tree to a pair of leaves or two; fruit spurs will thus in time be formed all along the lower branches, while these tufts of leaves will afford to the branches protection against the sun.

Cherry trees in general produce their fruit upon small spurs, or studs, from half-an-inch to two inches in length, which proceed from two, three, or four year old wood. New spurs will continue to shoot out right up to the extremities of the branches; in the centre of every cluster of fruit spurs there is a wood spur, which, as it extends each season, bursts into blossom and carries the year's crop; this should be remembered when pruning. These spurs will carry fruit for several years.

Once the cherry tree has commenced to fruit it should, unlike the peach and the apricot, be very sparingly touched with the knife, as it is besides very subject to "gumming." This peculiarity of the plant is aggravated in individuals presenting long stems exposed to the sun, on trees with many forked limbs, and on those which have had large limbs taken off. It is found that by doing all the necessary severe cutting during the summer, and after the crop has been gathered, the wounds heal more readily. Whenever a branch thicker than the size of the finger is cut off it is advisable to apply to the fresh cut a covering of white lead, gum shellac varnish, of hot wax or of clay.

The *Heart* and *Bigarreau* sorts, which are sweet varieties, are luxuriant growers, attaining large size, and possess large drooping leaves. Mazzard stock are preferred for these, the trees being long-lived, larger, and healthy when planted on fairly good loam.

The *Duke* and *Morellos* classes are slow growing sorts of the sour kind. The first have stiff and erect branches with smaller leaves, thicker and of a darker green color than the preceding classes; the second or Kentish Cherries are of a bushy habit, with smaller leaves still and more drooping and more numerous twigs. The branches must be kept far enough apart to admit the sun and

air freely amongst them, and the stem and main branches strengthened by cutting hard for several seasons. If the tree grows too luxuriantly, an occasional root pruning will throw it into fruit. They do best on Mahaleb stock, which gives smaller trees, but is more accommodating as regards soil. This stock gums on wet, retentive soil. If it were not for the sprouting habit, sour varieties on their own roots do very well. Cherry trees when shaped for the first few years as a rule keep a good form, and bear well without pruning.

PRUNING THE FILBERT.

Suckers should be carefully eradicated every season, and the bushes pruned somewhat after the fashion of the quince, or else they will be a mass of branches, and remain almost barren. Yet the filbert, in the majority of cases, is completely left to itself, although to be fruitful it requires proper and regular pruning. The blossoms, like those of the walnut, are monœcious, *i.e.*, the male flower or catkins, and the female flower are borne on the same tree, but from different buds. These fruit buds bear in a cluster at the extremity of small twigs, and are produced on shoots of one year's growth, and bear the next.

Unless the bushes are pruned, they bear very heavily one year, and remain barren several seasons to recuperate. The mode of pruning consists in cutting back severely the first few years, so as to favor the growth of side shoots, which are shortened to prevent the whole nourishment being carried to the top of the branch, the consequence being that small shoots grow from their base, which carry fruit. By this method of spurring, bearing shoots are produced, which would otherwise have remained dormant.

PRUNING THE WALNUT AND CHESTNUT.

Much of what is said about the pruning of the fig applies to these trees. Their habit of growth is symmetrical, and the growers will, by cutting off misplaced branches, broken or dead, and by shortening bending limbs, do much to keep them growing symmetrically. As their feeding roots are close to the surface, light hoeing only should be done in close proximity to the trees. They should be trained with a general upright tendency, so as to interfere as little as possible with cultivation. Limbs branching low down will protect the stem from sunburn.

PRUNING THE LOQUAT.

The loquat, or Japanese medlar, has hitherto been raised from the seed as a tree suitable for wind breaks. The choicer varieties are, however, now propagated by grafting or by budding, either on its own roots or on the quince, to which it is botanically somewhat related. In the first instance it forms large trees, which take four or five years to mature its fruit. In the second instance it comes into bearing at an earlier age. When grown for shelter the higher

trees worked on loquat seedlings should be selected and trained with a stem 3 or 4 feet high. In the second case, whether it is on its own or on quince roots, it should be headed lower down. As the tree carries permanent foliage, and later on heavy crops of fruit, the main limbs should be as strong and sturdy as possible, and trained with a generally upright direction. These in course of time, as the branches extend and carry more foliage and more fruit, will gradually be bent down, hence the importance of throwing strength and vigor into them at an early stage. This is done by encouraging the growth of three or four leaders, low down on the stem (if not grown as a wind break); all other shoots are either cut off or pinched back, and the young tree is subsequently shaped much in the same manner as has been explained in connection with the shaping and framing of young trees generally. The fruit bunches issue from the terminal points of young shoots. They bear at their base wood buds, which will in growing season push out young shoots. These, if too numerous, should be thinned out to two or three only, so as to insure for each its due share of light, air and sun. The decaying flower stalks are cut off, as well also as all dead branches.

PRUNING THE FIG.

Fig trees naturally form symmetrical heads. They are best shaped when young with the main arms arranged symmetrically round the stem. Figs for table purposes are headed low, so that the fruit can be picked without difficulty. Figs for drying are headed higher, so that the picking of the dead ripe and fallen fruit can be easily done over the smooth ground. The fig tree suckers pretty freely, and these should be removed in the winter time. Wherever the ground is rich the tree will often run excessively to wood, and in that case root pruning will force it into bearing. Drooping branches are cut off, and those growing obliquely upright retained. Dead wood and branches that cross and interfere with one another are suppressed, but the end of the shoots should be sparingly touched with the pruning knife on account of the mode of bearing of the tree. This is as follows:—The fruits are carried either singly or in pairs in the axils of the leaves, and they appear on the branch as growth proceeds. If a tree is examined after it has cast its leaves it is seen that all along the younger branches scars show where leaves grew the previous summer. At intervals, just over these scars, diminutive buds, which will in the spring constitute the first crop of figs, appear; while a pointed conical wood bud crowns the end of these branches. When spring comes the first crop of figs shows more plainly; the fruit hangs down from the branch without a leaf alongside of it. Further on the conical terminal shoot grows on and leaves come out around it; just in the axils of these leaves more diminutive buds also show, which, later in the summer, constitute the second crop of figs. In prolonged seasons the growth of terminal shoots, as well as of

laterals, continuing without interruption, may in this manner evolve even a third crop, but more generally the third crop remains dormant until the following early spring, and it is then a first crop again. It is thus seen that if laterals and terminals are cut back in the winter a proportion of the first crop is cut off, and this pruning leading to the growth of a greater number of laterals these will produce a larger second crop proportionately with the number of young shoots which have burst into growth. No apparent flower is seen on the fig, those organs being hidden from view by the skin which covers them; as the fruit enlarges the blossoms expand, and when fertilised the seeds mature.

Old fig trees which have grown in a distorted manner and require rejuvenating are simply cut hard back to the height desired, and the numerous latent shoots under the bark will, in the spring, start growing; these should be thinned out to a few only. Large wounds should be dressed with some covering mixture.

PRUNING THE OLIVE.

The tree should be kept low, and trained with a globular head, somewhat vase-shaped in the middle; this permits of easier and more careful gathering of the fruit by hand, and a larger surface exposed to the sun and light.

During the first year or two the main effort of the grower should consist in throwing all the vigor and energy of the young tree into one stem only. This is shortened at a height of three feet or so, and a head formed by allowing three to four branches to grow. Like all fruit trees, great expense is saved in gathering the crop by having the trees branched low; they are also better able to resist the winds, and the bodies are thus protected from the hot sun.

The olive bears its crop on the growth of the previous year, and it is therefore essential to favour the multiplication of new shoots in order to increase annual production. This is done by shortening the terminal shoots when shaping the trees, suppressing the "gluttons," or fruitless water shoots, removing all branches that are misplaced, crossed, or are in the way, and keeping down the suckers. A dense growth of foliage in the centre of the tree should be reduced by thinning out some of the branches. This also checks the black scale and the sooty mould. Whipping the branches in gathering the crop, or pruning off the young growth, will make the tree barren the following season.

The best time for pruning is after the severe winter frosts are over, and just before the sap begins to rise in the spring. In this country, however, where ground frost only is experienced, pruning can be done at any time in the winter, provided care is taken to coat any fresh wound with the gum shellac varnish, or a thin paste made of cow dung and clay.

PRUNING CITRUS TREES.

Citrus trees, which are evergreen, unlike deciduous trees, are not subjected to methodical annual pruning.

If the growth from the bud in the nursery is sufficiently vigorous, the young plant is headed back to 20 to 24 inches, and the crown is formed from a few well-placed laterals—three only by preference—growing symmetrically around the stump, at an interval of two or three inches from each other, so as to ward against the danger of splitting when the tree begins to bear heavily. Should, on the other hand, the growth in the nursery have failed to permit of the head being formed there, the tree is cut back at planting to a lesser height, and shaped as if dealing with a deciduous tree. As in the case of other trees, one stem alone should be allowed to grow. The object to aim at is to train a low-headed, stocky tree, with a short stem and a globular head, which shelters well the trunk, the main limbs, as well as the superficial roots of the tree. The knife and pruning saw should be used more sparingly on trees of the citrus tribe than on deciduous trees. Rank water shoots and dead or dying branches should be removed, as well as branches which cross and rub. If the branches grow too thickly in the centre a judicious thinning out is necessary to allow light and air to penetrate freely amongst them. This is done by cutting off small leafy twigs, which grow in the crotches of branches, as well as over the main and secondary arms. Trees thus thinned out afford less shelter and hiding place to scale insects and spores of fungoid diseases, which are thus kept in check. When sprayed or fumigated the spraying liquid or the deadly gas penetrate more readily the mass of foliage. Large wounds should be well pared off with the knife, and coated with white lead, gum shellac varnish, clay, or some other ointment.

The young tree is planted with its roots very shallow, or else gumming and canker of the wood at the collar will supervene and destroy it. The stem is tied up to a stake, all shoots below the bud are rubbed off, as well as those above the bud to a height of nine to twelve inches from the ground, and the head, consisting of three or four shoots, allowed to grow freely so as to strengthen the stem as well as the root system. Long rank shoots, often seen, more especially on lemon trees, are pinched hard back so as to favour the growth of laterals and balance the head of the tree.

Young plants should be encouraged to make as much wood as possible for the first three or four years, and any fruit showing after blossoming is rubbed off.

The orange and other citrous trees carry their fruit on one year old wood only, and at the extremity of their branches and twigs; after the crop is off, young dormant buds at the back of the previous season's fruit shoot out, overgrow last season's fruit stalk, and blossom in due season. It will thus be seen that the mode of shortening-in described for the peach is not applicable for trees of the citrus tribe, which would thereby be made barren for the next

season. It is also necessary, in order to obtain heavy crops, to maintain the tree in a thrifty state of growth.

Some varieties of citrus trees, and more especially the Thorny mandarin, grow a very thick and compact head, which requires some amount of thinning out and cutting back, or else they are given to overbear one season and vegetate the next, for the purpose of recuperating. The twigs besides, when left untouched, become so numerous and so puny that a large proportion of undersized and inferior fruit result in seasons of bearing of the trees, whereas no fruit at all is produced during the off year.



Fig. 1.—Cut Back to Force New Shoots for Budding.

It is at times desirable to renovate old citrus trees which through neglect or disease have ceased to become profitable. A common variety or a coarse type may also give place to a better sort. Whenever the roots are sound and growing in fertile soil, it may be expedient to cut off the top in the winter, after heavy frosts. A number of tender shoots then sprout out in the spring; these are thinned out to three or four, symmetrically placed around the stem, and when strong enough, in the summer or the early autumn, they are budded if it is desired to change the variety. See Fig. 1. As this lopping operation thus exposes the trunk to the full force of the summer sun, it is advisable to clothe it in coarse bagging, or to paint it with a protecting lime-wash.

PRUNING THE PERSIMMON.

Persimmons bear on new wood, hence the advisableness of pruning hard back to induce fresh growth. When cut the plant exudes through the wound a corrosive sap, which cakes on the blade of the knife or the secateur, and causes the cut branch to die back, unless the instrument is, at frequent intervals, cleaned on a piece of leather.

PRUNING THE PASSION VINE.

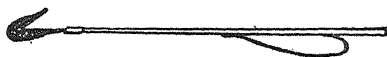
The passion vine is kept under control by pinching back and removing straggling shoots. Older vines can be rejuvenated by

cutting back to the main stalk, from which fresh shoots soon grow and replace the older ones.

PRUNING THE RASPBERRY AND BLACKBERRY.

At the time of planting, choose root canes or suckers with a good root system attached; cut the cane back about 12 inches above the ground. From the base, strong and sturdy fruit canes will spring up. During the summer keep weeds down by frequent shallow hoeing, and at the same time knock off the superabundant suckers that may appear, leaving only from four to six. Remember that deep digging with the spade or hoe is injurious to the plant, cutting its tufts of fibrous roots, which are surface feeders and nourish the crops. The plant carries deep, strong, woody roots as well, which produce and support the canes.

When the canes are several feet long they are topped off, and the subsequent laterals are pinched back about 12 inches from the stem. In the autumn, after the old crop has been gathered, the old canes, which will not fruit any more, are cut off close to the ground by means of a bent sharp hook fixed at the end of a long



cane. This implement may be made of an old rasp; the cutting edges come together at a point like the letter v, and will cut on both edges, while it will also catch and hold the cut cane, which has to be removed from amongst the canes left on the plant. Thus the newer canes have a better chance, under the additional amount of sun and air they get, to mature and become more fruitful. These should have 10 to 12 inches of their ends cut off, as this part has not summered properly and is of no value. By this means also noxious insects and fungoid diseases are also better destroyed, and the cutting of the spent canes is easier than if they were dead and dry.

Raspberries and blackberries are either trained upright or without supports, by cutting hard back, or, better still, by trellising over stakes, laths, or wires. On large plantations the pruning is done more economically—more especially in the case of the blackberry—and consists, besides removing the worn out canes in the autumn, in slashing the laterals on each side of the hedge in the summer, to allow cultivation, and tying the bunches together or to the trellis.

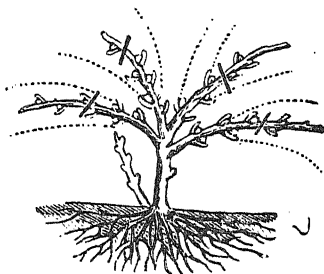
PRUNING GOOSEBERRY AND CURRANTS.

Both plants receive pretty well the same treatment. At planting, short jointed young shoots are cut about 14 to 18 inches long. It is advisable to blind with the knife or the blade of the secateur all the buds which will be underground, or else the plants will be continually throwing up suckers. The accompanying

illustration shows a bush with four branches, and a sucker springing from the base, which, unless carefully suppressed, will spoil its shape. The branches should be well raised above the ground, say 12 inches. By this means the fruit is kept clean, and sun and air having full access to the branches, favor its fruitfulness. To ensure this, the branches are cut half back, with the result that there are at least double



Gooseberry cutting.
(J. WRIGHT.)



Gooseberry bush a year from the cutting.
(J. WRIGHT.)

the number the next season, as shown by the dotted lines. When the time for the second pruning comes these canes are cut back to about 12 inches in length to good buds pointing upwards or outwards, so as to keep the bush well above the ground.

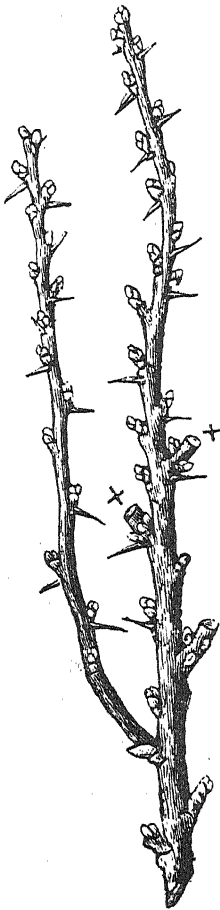
Unless gooseberries are pruned, the fruit never or seldom attains to any size, and the bush is soon exhausted. The gooseberry, like the currants, bears well on spurs of two years or older wood; they also bear well on the young annual shoots, when these are left with a certain amount of discretion.

The illustration, one and two-year old wood on a gooseberry branch, shows on the older wood natural spurs forming all along it, and also two lateral shoots cut back at (x x). Unless these had been cut back it would have been almost impossible to pass the hand down the head of the bush for gathering the crop. It is essential that all laterals should be shortened to at least allow the hand to reach to the centre of the bush. A young shoot as shown in the figure may be left at intervals, so as to enable the cutting back every few years of the worn-out older spur-carrying shoots in the centre, or the bushes have a tendency to soon cease bearing, except on the outside.

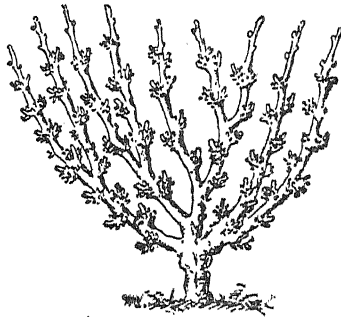
The Currant bushes are formed in the same way as the gooseberry bushes, but when the plant has as many branches as it can carry, the additional growth of fresh new wood should not be encouraged. The distance between the branches should be such

that the hat can be put amongst them. The illustration shows mostly fruit buds, except at the extremity of the branches, where the young wood has been cut back to about nine inches. In the summer both the gooseberry and the currant receive the following treatment :—

The young shoots which are seen pushing upwards are pinched back five or six inches in length as shown at (x x) in the following illustration ; this will



Gooseberry branch, one and two years old.—J. WRIGHT.

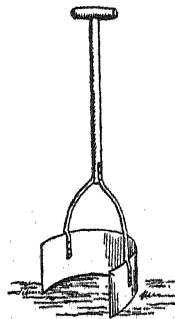


A red currant bush after pruning.—J. WRIGHT.

allow sun and air to reach the crop of fruit. A young shoot may here and there be left if there is room for its growth. Should fresh shoots show on those which have been cut back, they should be pinched again, so as to favour the formation of fruiting spurs.

PRUNING THE STRAWBERRY

Consists in trimming the roots at planting time so as to favour the growth of the fibrous roots which will feed the plant, and later on in cutting all runners before the fruiting season and as soon as they make their appearance. Unless this is done the fruiting of the plant will be seriously checked. Even after the fruiting, some growers still remove the runners, and only leave them on if young plants are required. In fact, treat all runners as weeds the first season. The illustration shows the design of a convenient runner cutter, which saves much trouble. The crescent blade is of such a diameter that it will encircle one side of a strawberry plant, and may be made with an



Strawberry runner cutter.

arc of about nine inches. The appliance is pushed down on one side of the plant, and then on the other side, thus cutting all runners



A fruiting branch of gooseberry.—J. WRIGHT.

spreading around. Where the ground is moist the leaves of the strawberry plants are mowed clean off in the winter, then gathered up with a rake and burned. This checks the spread of the leaf spot disease. The same purpose is at times attained by spraying the beds with a solution of sulphate of iron.

PRUNING THE TOMATO.

If large sized, early tomatoes are required, the plants should either be forced and planted out early, or sown towards the end of August, and protected from frost by means of a light mulching. One stalk only is allowed to grow, and lateral leaf shoots pinched off, the terminal shoot alone being allowed to remain. The fruit bearing laterals are left on the plant, and will soon set to fruit. The plant is trained either along short stakes or along a trellis, made of wire stretched between too short posts stuck at each end of the rows. This will keep the plants off the ground, and make the operations of spraying and picking easier. The tomato rot is not so severe on staked vines as on plants crawling over the damp ground, whilst by training the plants it is easier to get at the cut worms and the green caterpillars with arsenical baits and sprays. After a while a few leaf laterals are allowed to grow, if it is feared that the crop might be injured by sun-burn. Large sized and early tomatoes will thus be obtained. For home use the tomato plant is seldom pruned. It bears enormously, but the fruit is smaller and somewhat later in ripening.

GARDEN NOTES FOR AUGUST.

BY PERCY G. WICKEN.

The past month has been exceptionally dry for the time of the year. Reports from the South-Western district indicate that they are experiencing a splendid winter, while those from the Eastern districts complain of the want of rain. In the warmer parts of the State spring may be said to begin at the latter end of this month, but in the Southern portions frosts are likely to occur for some time to come. Preparations should now be made to get the ground in order for sowing whenever a favourable opportunity occurs. Land which is intended to be sown with vegetables should be freed from all weeds and given a good dressing of well-rotted stable manure, which should be spread evenly over the surface and then dug in and well mixed with the soil. Before planting any seeds the surface should be made as level and as fine as possible, so that the young tender shoots have every opportunity to obtain their necessary food from the soil, which they are unable to do when the ground is lumpy and rough. Most plants can be grown in a seed bed and transplanted into the garden, and this, as a rule, is the most economical method to carry out. Sufficient vegetables for home use can be raised on every farm in the State, with very little additional labor, which can be supplied at odd times by the members of the family.

ASPARAGUS is a vegetable very little grown in this State, and one that would prove a welcome addition to our list of table delicacies. The roots should be planted as soon as possible, because in the warmer districts they will begin to shoot out. Asparagus prefers a light, warm soil. A dressing of dung should be well mixed with the surface soil to a depth of 6 inches. When the ground is ready for planting dig holes about 6 inches deep, and large enough for the roots to be spread out evenly without touching the sides. Keep the centre of the plant an inch or two higher than the roots. This can be done by raising the soil in centre of the hole, making a little sort of mound, as it were. Fill in with fine soil by hand and press it firmly down, being careful not to injure the roots. The crown of the plant should be about 2 inches below the surface when covered up. The plants should be from 2½ feet to 3 feet apart. If roots cannot be obtained the grower will have to raise his own roots from seed, and the sowing had better be done in September or October.

ARTICHOKES (JERUSALEM).—These are a very useful plant to have growing; they make a welcome addition to the table, and are also valuable for feeding to pigs. They should be planted much in the same way as potatoes, in rows 3 feet apart and 1½ feet apart in the rows. They will grow in almost any kind of soil, and are of the same family as the Sunflower, and the leaf and flower is very similar to that of the Sunflower.

BEANS (FRENCH OR KIDNEY).—This is a very popular vegetable, and can now be sown in small quantities in districts where there is no danger of frosts.

BEET (RED).—Sow in drills about 18 inches apart, and cover the seed about 1 inch deep. Thin out to 16 inches apart as the plants make a good growth.

BEET (SILVER).—The leaf and not the root of this plant is used for food. Plant and treat the same as for Red Beet.

CABBAGE.—Plant out those that are fit from the seed beds, taking care to lift the roots carefully so that they do not get damaged or broken. Make seed beds for future use.

CARROT.—Sow in land that has been well cleaned of weeds, as the carrot is a slow grower and the weeds are likely to choke it out. Do not apply fresh manure to this crop, but sow in land that has been well manured for the previous crop.

CUCUMBER.—Sow seed under shelter, and at end of the month in the open. Those planted in the open will require to be sheltered at night.

ONIONS.—Sow freely of this wholesome vegetable in well drained land, and supply freely with good farmyard manure. They may either be planted in drills and thinned out or sown in a seed bed and transplanted.

PEAS.—Sow freely in well prepared land, and avoid manures containing nitrogen, such as nitrate of soda, sulphate of ammonia, blood manure, etc., and use manures containing potash, phosphoric acid, and lime. Plant in rows about 3 feet apart, according to variety, and about 6 inches apart in the rows. Put sticks along the rows as soon as the peas are a few inches high.

POTATOES.—Plant out the Kidney or Early Rose varieties in all the warmer localities; plant in rows 3 feet apart, and about 16 inches apart in the rows. Use good healthy-looking seed potatoes of medium size, and free from scab, potato moth, etc.

SWEET POTATOES.—Make a seed bed, and place tubers in the seed bed as described on page 76 of this issue, so as to have a good supply of cuttings to put out later on.

TOMATOES.—Sow in sheltered places well protected from frost in the warmer localities, and in the cooler parts in frames or boxes, so that the young plants can be covered at night.

FARM.—The wheat crops should now be well forward; where too much growth has not been made the crop may be harrowed and rolled; this improves the growth of the crop and leaves the ground in good order for the harvesting. In the warmer districts of the State the early varieties of Potatoes may be sown. Mangolds and Sugar Beet, if not already sown, should be put in as soon as possible; they require a deeply worked soil, are gross feeders, and require a liberal supply of manure; they are both of considerable value for feed for stock, and possess good fattening properties. Another crop that can be sown during this month to

advantage is Hungarian Millet; this crop is not grown to anything like the extent it should be. It is a very quick growing crop, and can be used either for green feed, hay, or grain, and is very useful for feeding sheep. If cut for hay it should be cut while the ears are green, as, if left too long, the little awns on the ears become hard, and have an injurious effect on the intestines of the animals eating them. Lucerne can still be sown, but the ground requires to be brought to a fine tilth, and to be free from weeds. Buckwheat is another crop that can be sown at the present time; it is very good feed for stock; it remains in flower for a long period, and is very valuable where bees are kept, and increases the flow of honey, but is not a heavy yielder as a forage plant. It is also a good time to plant out seeds and roots of the Golden Crown Grass (*Paspalum Dilatatum*).

THE BEST WHEAT FOR SEED.

SHRIVELLED *v.* PLUMP.

At a Western farmers' meeting held recently in Victoria, one of the members, Mr. A. Johnstone, read a paper on "Shrivelled *v.* Plump Wheat," which contained a deal of pertinent as well as interesting matter. He said—"The question of shrivelled wheat for seed purposes is one that has been frequently discussed, and some farmers have pronounced themselves in favour of it as against the plump or properly matured grain. I cannot speak from experience in the matter of wheat growing, but it strikes me that no plant can be successfully propagated from year to year from an immature parent. I admit that the wheat plant, if grown on rich land from shrivelled grain, may for one or two years give a fair return, as it so often occurs in nature, both in the animal and vegetable kingdoms, that they go back to the grand-parent, and so inherit in that way a worse or better stamina than they could derive from their last progenitor, but it would be very bad practice to continue sowing inferior seed if good is procurable.

"We all know that though the grain may be shrivelled and immature, still the germs of life in its centre may be fully developed; if it is so, then we get as good a sprout as we would from the plump grain. But the young wheat plant requires nourishment until it is able to draw for its subsistence from the ground, and if the seed has been shrivelled of course the substance is not there to impart that necessary nourishment to enable the embryo plant to produce a strong and healthy existence. I know from experience that vegetable and flower seeds when plump and well ripened always produce a more satisfactory crop than obtained if the seed is not in good condition, and, generally speaking, I have found that no amount of nursing will turn weakly plants into a satisfactory crop, and it comes to this—

"If the requisite stamina has not been sown in the seed bed

we seldom reap satisfaction in the harvest. Let us take, for instance, the potato, which, of course, is not, properly speaking, a seed, but a cutting with so many buds and eyes. Is it not the case that the crown eyes always send up the strongest shoots. Why? Because they are the most perfectly developed, and are ready to monopolise all the life in the sett, and the larger in reason the sett is the stronger will your plant be. I am a believer in uncut setts, for the reason that the ground coming in contact with the cut surface causes the latent germs of decay to set to work at once, and if the ground be wet the sett which has been cut does not last long enough to enable the young growth to set up a sturdy plant; in fact it very often occurs that in moist seasons very many setts cut do not grow at all, whereas in the uncut sett excessive moisture does not cause a rapid decay, thereby allowing the full benefit of its constituents as food for the infant fruit.

"We know that nature's primary object in giving fruit is simply as a covering to protect the seed. As the seed within matures, the fruit ripens, and when the seeds have properly ripened the fruit decays and sets free the seed within, so that it may burst forth and take root in the ground. It is different in the case of wheat. The composition of gluten, starch, etc., outside, is intended for more than a protection to the embryo plant inside. It is also meant to nurse it and provide it with a certain amount of food until it is able to go alone. I hold that as in the animal kingdom so it is in the vegetable, and no farmer or breeder of stock would think of building up a flock of sheep or mob of horses from anything but the best sires and dams. Then why should they use immature seed, and especially in the production of that staple product and food of man—wheat?"

DESTRUCTIVE BIRDS AND ANIMALS ACT.

As the outcome of the actions of the Secretary of the Department of Agriculture some two years ago, the introduction of hares into Western Australia was prohibited under the Destructive Birds and Animals Act. In the last issue of the *Government Gazette* a proclamation appears placing the administration of this Act in the hands of the Hon. the Minister for Lands. This should ensure additional vigilance in the matter of preventing the introduction of birds and animals which might prove a source of danger to our fruit and farming industries. The *Gazette* notice referred to appears elsewhere in this issue.

OPPORTUNITY FOR LEARNING BEE FARMING.—One of the largest beekeepers in this State has an opening at his apiary for a youth or young man to learn the business, which will be thoroughly taught in all its branches. For further particulars apply Department of Agriculture.

ANSWERS TO CORRESPONDENTS.

Mr. J. N. Cox, Athgarvan, writes:—"About two years ago the analyst of your Department tested several samples of Victorian butter and found, I think, that every sample was adulterated. A local storekeeper tells me that his customers prefer 'box butter,' Victorian or New Zealand, 'because it will spread (*sic*) on the coldest morning,' whereas local productions, guiltless of lard, require to be dealt with like cheese on a frosty day. This strikes me as a forcible example of practice corroborating science." The matter being referred to the Dairy Expert, Mr. Crawford replies as follows:—"The fact of butter spreading easily in cold weather does not indicate that adulteration has taken place. Butter that is made from cream that has been mechanically separated from the milk has a different texture to that obtained by cream obtained by setting the milk in dishes. The latter is much firmer, while the former is more fluent. This applies to all butter made from separated or pasteurised cream. I have not known or seen any account of lard being used in Australia for adulterating butter."

Beginner, King River, writes:—"Will you kindly answer the following questions in the next issue of the JOURNAL. 1. Should only two shoots from each branch in an apple tree be allowed to grow unchecked and the others pinched back or partially fractured, or is the tree, after the fifth year of training allowed to grow unchecked in summer and the shoots merely shortened in winter? 2. Should the method of pinching the side shoots be applied to apricots and cherries as well as apples?" The matter being referred to the Horticultural and Viticultural Expert, Mr. Despeissis replies:—"1. Beginner seems to have got a grasp of the method of pruning trees trained as low standards with a vase-shape head. After the fifth year, and provided the tree has entered the period of bearing, less pruning will be required. Supposing the tree was started with three main arms the first year, it will have six secondary arms the second year, twelve leading branches the third, twenty-four the fourth and seventy-two the fifth year, always provided it has been possible to train the young trees on theoretically accurate lines, which in practise is not often possible. The other shoots are pinched back or fractured in the summer and then turned into fruit-bearing spurs. Any strong shoots not needed for branches should be cut off clean. It may be necessary after the fifth year to still continue this system for a year or two longer, when the shoots are merely shortened in the winter, branches which are bent down by the weight of fruit and thus cross and rub against others, are so cut back that no injury from this cause results to the tree, and dead wood removed. 2. The short spurs should not be removed or cut back, the longer ones are shortened a little."

MARKET REPORT.

FOR MONTH ENDING AUGUST 10.

The W.A. General Produce Co. report sales effected for the following articles, on account of various consignees, for the month ending August 10:—Sales during the past month have been very active, supplies of farm produce not over plentiful, dairy lines supplies slightly better, and values locally a shade easier. Bacon, reliable brands of medium weights selling freely, f.o.b., values have advanced $\frac{1}{4}$ d lb. Hams, Farmer's and Hutton's still favourites with traders, selling regularly at steady prices. Butter, beginning of last week, f.o.b., Melbourne, values eased somewhat, but before end of same week a rise took place, present position stands that higher rates will rule owing to cold weather prevailing. Lard, extremely scarce, both on spot as well as Eastern States. Cheese, some substantial parcels advised as being afloat from N.Z., and expect on arrival good business will result. Eggs, supplies of locals daily increasing, values slightly easier, but operations for the week have been very satisfactory.

traders showing strong support towards the local fresh, reliable article, as against imported lots. Potatoes, four supplies on spot, values tendency to keep high right through the season. Onions, rising by leaps and bounds throughout the Eastern States, and as it naturally follows, locally. Chaff, of late values: weakening, owing, no doubt, to many direct offers to sell on behalf of growers, thus coupled with those of agents' quotes, causing forced sort of feeling with buyers. Bran and pollard, both articles are in continuous demand, values keeping quite firm. Flour, usual sales, without much alteration in value; imported lots predominating. Oats, unchanged. Wheat, very little alteration. Oilcake, further rise of 5s per ton has taken place yesterday f.o.b., Sydney. Fruit, local, arriving pretty freely, selling at good prices; imported rather scarce, especially bananas, owing no doubt to heavy losses of late, importers are having a spell. Vegetables, supplies fairly good, prices substantial. Poultry, evidently after the great glut experienced during Royal festivities, now supplies very short, and good prime table birds are realising good prices, especially fat ducks. Carcase pork, cleanly butchered and fresh finds good outlet, likewise kangaroo meat. Artificial manures have been in great demand; of late stock on spot very light. Seed potatoes, we have had a splendid run with orders from various parts of the country, supplies hardly sufficient. Bags and sacks selling slowly.

Farm and Dairy Produce.—Bacon sides—from 10d, 10½d to 11d per lb. Hams—Farmer's and Hutton's, 1s 2d to 1s 2½d per lb; others from 1s to 1s 1d per lb. Butter—Victorian, 1s 6d per lb.; N.Z., 1s 4½d to 1s 5d per lb. Cheese—N.Z. loaf, 8½d to 9d per lb; mediums, 8d to 8½d per lb; other lots from 6d to 7d per lb. Eggs—Local, from 1s 6d to 1s 9d per doz. Potatoes—Imported, £9 10s to £10 per ton. Onions—Imported, 16s to 17s 6d. per cwt. Chaff—Worth from £4 to £5 per ton. Bran—£6 15s to £7 5s per ton. Pollard—£6 17s 6d to £7 10s. per ton. Flour—£9 10s to £10 per ton. Oats—3s 3d to 3s 6d per bushel. Maize—Whole feed, 5s to 6s per bushel. Wheat—4s 3d to 4s 6d per bushel. Oilcake—£8 to £8 10s per ton. Peas—Dry, 4s 9d to 5s per bushel.

Fruit and Vegetables.—Oranges—Local, from 6s 6d to 10s 6d per case. Lemons—Local, from 4s to 7s 6d per case. Mandarines—Local, worth 2s to 30s per case. Loquats—Worth 10s to 15s per case. Passion Fruit—Worth 8s to 12s per case. Apples—Imported, 14s to 18s 6d per case. Cabbage—Worth from 4s to 6s 6d per cwt. Cauliflowers—Worth from 1s 6d to 7s 6d per dozen. Carrots and Parsnips—1s 6d dozen bunches. Turnips—Swedes, £4 10s to £5 10s per ton. Pumpkins—Worth 6s to 8s per cwt. Rhubarb—Worth 1½d to 4d per lb.

Salads and Herbs.—Lettuce—Worth 6d to 8d per doz. bunches. Spring Onions—Worth 8d per doz. bunches. Beetroot—Worth 1s 6d to 2s per doz. bunches. Celery—Worth 1s 6d to 3s per doz. heads. Cress—Worth 6d per doz. bunches. Thyme, Marjoram, sage, off stalk, 9d per lb. Mint—Off stalk, 6d per lb.

Poultry.—Fowls—Prime table, 6s to 7s 6d per pair; others from 4s per pair. Chickens—2s 6d to 3s 6d per pair. Ducks, 8s to 9s per pair; ducklings, 6s to 6s 6d per pair. Geese—12s to 14s per pair. Turkeys—Gobblers, 22s 6d per pair; hens, 12s 6d to 14s per pair.

Kangaroo Meat and Kangaroo Tails—Worth 3d to 4d per lb.

Carcase Meat.—Pork—40lb. to 60lb., 6d to 6½d per lb.; others from 4½d to 5½d per lb.

Sundries—Bonedust—£7 to £7 10s per ton. Phosphate—£5 per ton. Superphosphate—£6 10s per ton. Guano—Dead, £5 10s per ton. Coarse Bacon Salt—£3 per ton. New Cornsacks—7s 6d per dozen; second-hand, 4s 6d per dozen. New Bran Bags—4s 9d per dozen; second-hand, 3s 6d per dozen. Pork Skins—1s 4d to 1s 4½d per lb. Mutton Skins—1s to 1s 3d per lb. Skewers—7s per 1,000. Antiseptic, 1s 6d per gallon. Preservative—1s per lb. Saltpetre—35s per cwt.

THE CLIMATE OF WESTERN AUSTRALIA DURING JULY, 1901.

Although the rainfall in the neighborhood of Perth was considerably in excess of the average for previous years, the general impression was that of a remarkably fine and pleasant month.

The total fall recorded at the Observatory was 8.60 inches, but an analysis of this reveals the fact that between the hours of 9 a.m. and 6 p.m. throughout the month only 21 hours of actual rainfall was experienced. Ordinary winter storms set in on the 5th, 10th, 16th and 21st. The first and last of these were comparatively unimportant, although that of the 21st was associated later on with particularly heavy weather in the Bight and apparently with unprecedentedly cold weather and snowstorms in the Eastern States.

Most of our rain and heaviest gales were connected with the "lows" on the 10th and 16th.

Cold, brisk, anti-cyclonic weather prevailed with a slight break on the 5th and 6th, between the 28th of last month and the evening of the 10th of the present one. During this time intensely cold nights were experienced, especially inland, the frost and ice being exceptionally severe, and the minimum readings of the terrestrial thermometers on the surface of the ground being considerably lower than any previous record. For example:—

Date.		Katanning.		Southern Cross.		Coolgardie.
1901, July 1	...	25.5	...	36.2	...	37.2
" 2	...	23.0	...	39.9	...	27.4
" 3	...	19.0	...	26.2	...	24.6
" 4	...	18.0	...	24.5	...	20.9
" 5	...	24.5	...	27.0	...	—
" 6	...	32.5	...	37.6	...	—
" 7	...	34.0	...	28.1	...	34.0
" 8	...	24.5	...	24.2	...	28.1
" 9	...	22.0	...	30.9	...	32.0
" 10	...	22.8	...	27.1	...	32.0

These figures deserve careful study by farmers.

Another interval of three days fine weather with cold nights was experienced between the 14th and 16th.

On the early morning of the 22nd the showery weather cleared up in connection with an anti-cyclone, which proved to be one of the most remarkable that has been experienced in the history of Australian Meteorology. It will always be remembered in this State in connection with the visit of H.R.H. the Duke of Cornwall and York. The weather cleared just prior to his arrival, and remained magnificently fine until some time after his departure. Between the early morning of the 22nd and the evening of the 31st, practically 10 clear days, not a drop of rain fell in Perth. This, though unusual for July, is by no means unparalleled, for in July 1884 there were 11 days consecutive fine weather, then one day's rainfall followed by five more days without a drop; in July, 1891, there were 13 consecutive fine days, and in 1894 and 1898 there were 10. The anti-cyclone showed signs of leaving us on the 25th, but for some unknown reason instead of proceeding towards the centre of the continent it was squeezed south towards Albany, accompanied by some rain and southerly gales in that neighborhood.

It then expanded again northwards, and Perth and Albany on the mornings of the 27th registered the highest barometers ever recorded in those places (30.706 and 30.711 respectively.) It then at last commenced to move definitely eastwards, and on the 28th Kalgoorlie registered 30.809, certainly the highest reading ever recorded in this State, and probably a record for the whole of Australia.

The rainfall on the whole was about normal throughout the State, except in the N.W. between La Grange Bay and Cossack and extending inland to Nullagine, where very unusual rains fell during the early part of the month, particularly between the 6th and 12th. These were quite phenomenal as far as our records extend, the greatest amount being 609 at Warrawoona.

The following short table is of considerable practical importance, showing the mean and lowest temperatures registered by a minimum thermometer placed on the surface of the ground.

Cue	...	37.6	...	26.0
Coolgardie	...	33.2	...	20.9
Southern Cross	...	32.9	...	24.2
York	...	34.1	...	25.0
Perth Observatory	...	41.1	...	33.4
Katanning	...	28.5	...	18.0
Bridgetown	...	30.2	...	21.0
Karridale	...	38.6	...	25.8

THE CLIMATE OF WESTERN AUSTRALIA DURING JULY, 1901.

Locality.	Barometer (corrected and reduced to sea level).				Shade Temperature.				Average for Previous Years.				Rainfall.	
	Mean of 9 a.m. and 3 p.m. years.	Aver- age for Pre- vious years.	High- est.	Low- est.	July 1901.				Mean Max.	Mean Min.	Highest ever re- corded.	Lowest ever re- corded.	Points (100 to inch) in month.	Total Points since Jan. 1.
					Mean Max.	Mean Min.	Mean of Month.	Highest Max.							Lowest Min.
Wyndham	...	30.047	30.017	30.320	29.992	84.9	64.3	74.6	88.7	62.8	107.0	50.0	Nil	1371
Derby	...	30.041	30.032	30.284	29.876	83.8	58.5	71.1	84.0	56.6	99.0	42.0	13	1066
Broome	...	30.042	30.037	30.284	29.857	78.1	58.8	68.4	80.4	55.7	91.2	38.0	22	3187
Condon	...	30.126	30.084	30.301	29.931	77.0	53.2	65.1	76.9	51.2	88.0	39.0	173	2434
Cossack	...	30.133	30.068	30.374	29.906	71.8	54.7	63.2	82.0	46.8	92.0	45.0	71	800
Onslow	...	30.086	30.122	30.320	29.884	75.0	50.1	62.6	76.6	49.5	88.0	37.0	Nil	248
Carnarvon	...	30.147	30.096	30.387	29.895	72.0	48.9	60.4	76.4	49.8	86.0	39.0	116	553
Hamelin Pool	...	30.170	—	30.452	29.857	68.8	49.6	59.2	69.9	48.2	77.2	36.6	180	383
Geraldton	...	30.181	30.150	30.528	29.837	68.4	47.1	57.8	74.8	35.5	88.8	36.4	266	1191
Hall's Creek	...	30.156	—	30.447	30.012	77.1	49.1	63.1	88.8	35.4	—	—	Nil	1541
Marble Bar	...	—	—	—	—	72.6	51.9	62.2	—	—	—	—	517	1873
Nullagine	...	30.188	—	30.522	29.889	—	—	—	—	—	—	—	263	1824
Peak Hill	...	30.217	—	30.600	29.855	64.7	42.9	53.8	—	—	—	—	71	670
Wiluna	...	—	—	—	—	—	37.9	—	—	—	—	—	55	698
Cue	...	30.254	30.177	30.618	29.850	66.9	42.7	54.8	67.5	45.4	78.2	35.0	37	424
Yalgoo	...	30.210	30.166	30.597	29.876	64.6	41.1	52.8	66.0	43.0	78.0	32.0	96	403
Lawlers	...	30.249	—	30.673	29.723	61.9	40.6	51.2	—	—	—	—	40	597
Laverton	...	30.278	—	30.720	29.861	61.5	38.2	49.8	—	—	—	—	62	581
Menzies	...	30.262	30.193	30.745	29.748	60.3	40.9	50.6	64.4	42.7	77.0	32.0	44	591
Kalgoorlie	...	30.261	30.185	30.812	29.675	59.9	41.1	50.5	63.7	43.4	76.2	33.2	60	485
Coolgardie	...	30.240	—	30.766	29.659	60.4	39.4	49.9	63.2	42.6	75.3	32.8	49	444
Southern Cross	...	30.250	30.161	30.737	29.670	61.9	37.3	49.6	64.2	37.1	79.0	27.0	108	478

The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

THE CLIMATE OF WESTERN AUSTRALIA DURING JULY, 1901.—Continued.

Locality.	Barometer (corrected and reduced to sea level.)			Shade Temperature.				Average for Previous Years.				Rainfall.	
	Mean of 9 a.m. and 3 p.m. years.	Average for previous years.	High-est.	Low-est.	July 1901.				Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever re-versed.	Points (100 to inch) in month, Jan. 1.
					Mean Max.	Mean Min.	Mean of Month.	Highest of Max.					
Northam	62.6	36.3	49.4	70.8	60.4	40.8	71.2	27.0	172
York	64.0	40.6	52.3	72.2	—	—	—	—	246
Guildford	63.1	45.0	54.0	71.0	63.9	46.1	75.2	33.0	735
Perth Gardens	63.0	46.0	54.5	72.8	63.8	48.5	73.8	38.1	801
Perth Observatory	62.9	48.5	55.7	69.0	62.3	48.6	71.0	37.0	860
Fremantle	61.9	52.3	57.1	68.6	63.0	50.3	72.5	38.0	2528
Rottnest	—	—	—	—	—	—	—	—	573
Mandurah	—	—	—	—	—	—	—	—	1898
Wandering	—	—	—	—	—	—	—	—	655
Collie	60.7	32.8	46.8	68.0	—	—	—	—	1707
Bunbury	63.5	43.5	53.5	67.5	—	—	—	—	612
Busselton	61.6	43.1	52.4	66.5	62.2	46.2	73.0	32.0	2028
Bridgetown	60.4	34.9	46.6	68.3	—	—	—	—	264
Karridale	62.0	44.5	53.2	68.5	—	—	—	—	1054
Cape Leewin	61.4	52.0	56.7	68.2	61.6	47.5	70.8	34.2	442
Katanning	58.5	36.4	47.4	66.0	53.4	39.5	70.6	27.0	2392
Albany	61.8	42.9	52.4	69.0	62.0	46.2	73.0	32.0	621
Breaksea	63.0	49.0	56.0	68.6	—	—	—	—	2139
Esperance	62.4	43.8	53.1	71.2	59.1	39.5	68.2	27.0	628
Balladonia	61.4	37.5	49.4	74.0	58.9	45.8	73.5	30.0	1050
Eyre	61.5	41.6	51.6	70.7	60.4	49.9	71.8	40.0	465
...	—	—	—	—	62.6	45.1	77.5	31.0	763
...	—	—	—	—	—	—	—	—	2823
...	—	—	—	—	—	—	—	—	172
...	—	—	—	—	—	—	—	—	995
...	—	—	—	—	—	—	—	—	329
...	—	—	—	—	—	—	—	—	1524
...	—	—	—	—	—	—	—	—	306
...	—	—	—	—	—	—	—	—	1165
...	—	—	—	—	—	—	—	—	231
...	—	—	—	—	—	—	—	—	1548
...	—	—	—	—	—	—	—	—	28
...	—	—	—	—	—	—	—	—	321
...	—	—	—	—	—	—	—	—	92
...	—	—	—	—	—	—	—	—	477

The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

THE OBSERVATORY, PERTH, 5th August, 1901.

W. E. COOKE. Government Astronomer.

RAINFALL for June, 1901 (completed as far as possible),
and for July, 1901 (principally from Telegraphic Reports).

STATIONS.	JUNE.		JULY.		STATIONS.	JUNE.		JULY.	
	No. of points. 100 equals lin.	No. of wet days.	No. of points. 100 equals lin.	No. of wet days.		No. of points. 100 equals lin.	No. of wet days.	No. of points. 100 equals lin.	No. of wet days.
EAST KIMBERLEY:					N'TH-WEST—Cont.				
Wyndham ..	Nil	...	Nil	..	Tambrey ..	91	6	..	..
6-Mile ..	...	...	..	..	Millstream ..	94	5	..	..
Carlton ..	...	...	..	..	Mallina ..	158	4	..	..
Denham ..	..	..	..	..	Whim Creek ..	135	4	74	5
Rosewood Downs ..	..	..	..	..	Cooyapooya ..	96	6	..	..
Argyle Downs ..	..	..	..	..	Woodbroke ..	93	5	..	..
Lisadell ..	..	..	..	..	Croydon ..	139	6	..	..
Turkey Creek ..	16	2	Nil	..	Balla Balla ..	118	6	155	7
Ord River ..	..	..	..	..	Roebourne ..	113	7	62	5
Plympton (St.M.)	16	..	..	..	Cossack ..	72	5	71	5
Hall's Creek ..	71	..	Nil	..	Fortescue ..	72	6	4	2
Flora Valley ..	..	..	..	..	Mardie ..	171	4	..	..
Ruby Creek ..	..	..	..	..	Mt. Stewart ..	6	2	..	..
Denison Downs ..	..	..	..	..	Chinginarra ..	95	2	..	..
WEST KIMBERLEY:					Peedamullah ..	152	4	..	..
Obagama ..	..	..	..	..	Onslow ..	72	5	Nil	..
Derby ..	25	3	13	..	Red Hill ..	51	4	..	..
Yeeda ..	..	..	..	..	Mt. Mortimer ..	38	3	..	..
Liveringa ..	67	3	..	..	Nanutarra ..	43	3	..	..
Mt. Anderson ..	63	4	..	..	Point Cloates ..	220	9	57	..
Leopold Downs ..	66	1	..	..	GASCOYNE:				
Fitzroy Crossing	238	4	Nil	..	Winning Pool ..	185	4	31	3
Quambun ..	88	6	..	..	Towara ..	155	3	..	..
Nookanbah ..	..	..	..	..	Ullawarra ..	80	2	..	..
Broome ..	973	7	22	..	Bangemall ..	72	3	..	..
Thangoo ..	..	..	..	..	Minnie Creek ..	95	3	..	..
La Grange Bay ..	488	6	24½	3	Yanyearreddy ..	112	3	..	..
NORTH-WEST:					Williambury ..	155	4	..	..
Wallal ..	239	7	278	7	Boolathana ..	188	7	..	..
Condon ..	205	6	173	..	Carnarvon ..	131	7	116	..
DeGrey River ..	137	4	..	..	Dirk Hartog Is ..	416	10	268	..
Port Hedland ..	61	8	179	7	Mungarra ..	105	3	..	..
Boodarie ..	74	2	..	..	Clifton Downs ..	..	..	..	..
Yule River ..	..	..	..	..	Tamala ..	316	12	..	..
Warralong ..	96	7	..	..	Meedo ..	98	3	..	..
Muccan ..	163	5	..	..	Sharks Bay ..	131	5	219	3
Ettrick ..	157	4	..	..	Kararang ..	329	11	..	..
Eel Creek ..	..	..	..	..	Wooramel ..	45	4	114	3
Coongon ..	..	..	..	..	Hamelin Pool ..	153	7	180	7
Warrawagine ..	282	7	..	..	Byro ..	80	3	49	4
Bamboo Creek ..	227	4	390	6	Berringarra ..	66	3	..	..
Marble Bar ..	154	8	517	7	Mt Gould ..	..	..	..	..
Warrawoona ..	81	8	642	7	Peak Hill ..	41	2	71	..
Corunna Downs	44	6	..	..	Horseshoe ..	24	4	63	5
Nullagine ..	30	2	263	..	Abbotts ..	32	4	27	4
Yandicoogina ..	86	7	568	7	Mileura ..	45	2	49	2
Tambourah ..	67	3	..	..	Manfred ..	17	2	24	2
Mulga Downs ..	45	2	..	..	Meelya ..	151	4	..	..
Woodstock ..	Nil	..	..	..	Woogorong ..	..	..	..	..
					Belele ..	18	2	..	..

RAINFALL.—Continued.

STATIONS.	JUNE.		JULY.		STATIONS.	JUNE.		JULY.	
	No. of points 100 equals lin.	No. of wet days.	No. of points. 100 equals lin.	No. of wet days.		No. of points. 100 equals lin.	No. of wet days.	No. of points. 100 equals lin.	No. of wet days.
GASCOYNE--Cont.					S. W. Div.—Cont.				
Billabolong ..	170	6	73	3	Belvoir ..	476	15	574	11
Wooleane ..	..	..	79	3	Guildford ..	511	16	735	11
Murgoo ..	94	3	77	3	Kallyamba ..	601	18	646	11
Meka ..	99	6	107	3	Can'ing W'works	745	15	..	..
Mt. Wittenoom..	57	5	87	3	Perth Gardens ..	704	19	801	12
Nannine ..	48	3	40	3	„ Observatory	717	19	860	12
Star of the East	37	4	51	4	Subiaco ..	680	17	830	11
Annean ..	55	2	..	..	Claremont ..	703	16	729	12
Tuckanarra ..	29	3	30	4	„ Richardson	606	15	708	12
Coodardy ..	35	4	..	..	Armadale ..	424	13	754	11
Cue ..	70	7	37	3	Fremantle ..	536	17	573	11
Day Dawn ..	52	6	19	2	Rottneet ..	456	21	655	12
Lake Austin ..	40	4	36	4	Rockingham ..	526	14	549	12
Lennonville ..	46	4	53	4	Canning River ..	672	16	598	10
Mt. Magnet ..	57	7	54	3	Jarrahdale ..	652	16	696	10
Challa ..	44	4	56	2	Mandurah ..	565	16	612	12
Youeragabbie ..	34	2	52	1	Pinjarrah ..	384	14	581	12
Murrum ..	39	3	..	..	Harvey ..	476	17	526	13
Yalgoo ..	84	7	96	..	SOUTH-WEST, CENTRAL PART (INLAND):				
Gullewa ..	172	7	107	6	Momberkine ..	267	10	205	8
SOUTH-WEST DIVISION (N'N PART):					Culham ..	303	11	195	7
Murchison House	365	9	..	..	Newcastle ..	393	13	226	8
Mt. View ..	276	14	..	..	Eumalga ..	383	13	283	7
Northampton ..	381	12	337	8	Northam ..	311	13	172	8
Mt. Erin ..	420	11	320	9	Grass Valley ..	313	13	167	5
Oakabella ..	173	4	..	..	Meckering ..	269	10	117	6
Narra Tarra ..	413	10	257	6	Cunderdin ..	256	10	160	6
Tibradden ..	439	7	..	..	Doongin ..	207	9	130	6
Sand Springs ..	412	11	275	8	Whitehaven ..	327	15	174	10
Mullewa ..	258	7	156	4	Sunset Hills ..	275	13	220	8
Bootenal ..	311	9	257	7	Cobham ..	339	15	282	11
Geraldton ..	459	18	266	10	York ..	346	13	246	8
Greenough ..	432	13	538	7	Beverley ..	234	12	212	8
Dongara ..	479	10	319	6	Barrington ..	342	15	224	7
Dongara (Pearse)	490	12	278	7	Sunning Hill ..	230	11	293	10
Strawberry ..	245	9	..	..	Wandering ..	252	15	264	9
Minginew ..	337	17	230	9	Pingelly ..	202	8	239	11
Rothesay ..	..	..	..	..	Marradong ..	341	13	233	10
Field's Find ..	22	5	..	..	Bannister ..	278	15	306	9
Carnamah ..	255	14	187	7	Narrogin ..	212	12	243	10
Watheroo ..	264	13	223	9	Wickepin ..	238	13	156	9
Dandaragan ..	446	14	245	7	SOUTH-WEST DIVISION (S'N PART):				
Moora ..	324	15	245	8	Bunbury ..	435	13	621	11
Yatheroo ..	530	15	374	11	Collie ..	498	16	442	16
Walebing ..	361	16	273	11	S.A. Settlement	478	14	441	14
New Norcia ..	382	15	296	12	Glen Mervyn ..	370	15	559	11
SOUTH-WEST DIVISION, CENTRAL (COASTAL):					Dardanup ..	428	13	485	10
Gingin ..	542	15	803	11	Donnybrook ..	393	16	513	13
Mundaring ..	640	16	659	11	Boyanup ..	422	18	647	12

RAINFALL.—Continued.

STATIONS.	JUNE.		JULY.		STATIONS.	JUNE.		JULY.	
	No. of points. 100 equals 1in.	No. of wet days.	No. of points. 100 equals 1in.	No. of wet days.		No. of points. 100 equals 1in.	No. of wet days.	No. of points. 100 equals 1in.	No. of wet days.
SOUTH-WEST—Cont.					EASTERN DIV.—Cont.				
Busselton ..	446	21	628	14	Mt. Morgans ..	74	5	33	3
Quindalup ..	503	19	1026	13	Laverton ..	62	4	62	..
Margaret River..	536	20	1198	14	Murrin Murrin ..	89	8	67	6
Lower Blackwood	595	13	409	11	The Granites ..	55	2	35	..
Karridale ..	712	22	763	18	Tampa ..	19	5	40	3
Augusta ..	483	18	720	13	Niagara ..	70	3	51	7
Cape Leeuwin ..	443	25	622	23	Yerilla ..	33	4	63	5
Biddellia ..	575	18	..	..	Menzies ..	84	5	44	4
The Warren ..	752	15	..	..	Mulline ..	100	8	..	..
Lake Muir ..	501	20	423	13	Waverley ..	78	2	86	6
Mordalup ..	270	17	387	13	Goongarrie ..	79	4	34	4
Deeside ..	417	13	449	10	Mulwarrie ..	104	4	75	6
Riverside ..	477	17	517	12	Kurawa ..	94	6	71	7
Balbarup ..	464	17	500	11	Dixie Gold Mine	107	7	53	5
Wilgarup ..	461	15	518	8	Kurnalpi ..	49	5	79	7
Mandalup ..	389	13	483	12	Bulong ..	55	6	69	7
Bridgetown ..	447	17	465	11	Kanowna ..	57	6	81	8
Greenbushes ..	425	12	508	12	Kalgoorlie ..	84	6	60	6
Williams ..	223	11	240	13	Coolgardie ..	90	7	49	6
Arthur ..	203	16	199	10	Burbanks ..	103	8	68	6
Darkan ..	228	10	226	10	Woolubar ..	69	6	40	4
Wagin ..	174	14	161	8	Widgiemooltha..	105	6	42	7
Glencove ..	192	13	209	11	50-Mile Tank ..	203	6	54	4
Dyliabing ..	167	7	223	9	Norseman ..	175	6	71	10
Katanning ..	201	13	172	10	Bulla Bulling ..	191	..	..	..
Kojonup ..	267	12	233	8	Woolgangie ..	200	5	83	4
Broomehill ..	209	16	215	12	Boorabbin ..	147	10	97	8
Sunnyside ..	220	17	223	12	Karalee ..	130	9	..	..
Woodyarrup ..	196	13	221	10	Southern Cross..	143	10	108	4
Cranbrook ..	254	13	222	7	Mount Jackson ..	121	7	78	6
Blackwattle ..	312	10	..	..	Burracoppin ..	141	8	..	..
Mt. Barker ..	351	16	284	12	Kellerberrin ..	233	14	124	6
Kendenup ..	371	16	230	11	Mangowine ..	223	16	..	..
St. Werburgh's...	350	20	..	..	Waltoning ..	..	..	..	..
Forest Hill ..	488	25	405	16	EUCLA DIVISION:				
Denmark ..	850	18	464	13	Ravensthorpe ..	287	11	120	..
Albany ..	535	18	329	15	Coconarup ..	..	..	..	..
Point King ..	522	17	393	10	Hopetoun ..	318	16	103	11
Breaksea ..	385	19	306	13	Fanny's Cove ..	585	16	..	..
Cape Riche ..	304	12	..	..	Park Farm ..	522	15	..	..
Pallinup ..	175	12	151	10	Esperance ..	856	17	231	..
Bremer Bay ..	523	14	..	..	Gibson's Soak ..	619	13	..	..
Jarramongup ..	136	9	..	..	30-Mile Condenser	307	9	..	..
EASTERN DIVISION:					Swan Lagoon ..	291	18	..	..
Lake Way ..	20	4	55	6	Lynburn ..	549	14	..	..
Mt. Sir Samuel..	8	3	53	5	Grass Patch ..	322	14	..	..
Lawlers ..	25	6	40	..	Israelite Bay ..	123	10	110	13
Diorite King ..	41	4	85	4	Frazer Range ..	70	9	..	..
Sturt Meadows ..	..	..	..	..	Balladonia ..	12	3	28	..
Mt. Leonora ..	20	4	77	6	Eyre ..	39	..	92	..
Mt. Malcolm ..	58	4	61	2	Eucla ..	70	8	126	10

The Observatory, Perth, August 8, 1901.

W. E. COOKE, Govt. Astronomer.

RETURN OF FRUIT IMPORTED INTO WESTERN AUSTRALIA DURING JULY, 1901.

NAME OF PORT	No. of Ships.	No. of Consign- ments Inspected.	Total No. of Cases.	No. of Cases Passed.	No. of Cases Prohibited.	No. of Cases Destroyed.	No. of Cases in Quarantine.	No. of Cases Dipped.	No. of Cases of																
									Apples.	Apricots.	Bananas.	Cherries.	Goosecherries.	Lemons.	Nectarines.	Oranges.	Passion Fruit.	Pears.	Plums.	Rhubarb.	Strawberries.	Pomoloos.	Pines.	All other fruits.	
FREEMANTLE ..	14	45	6203	5754	390	399	150	6203	1383	..	2416	..	..	132	..	910	425	300	..	..	..	..	..	88	..
ALBANY ..	6	6	187	184	3	3	..	187	25	..	22	..	..	10	..	104	15	8	..	..	..	..	..	..	..
GERALDTON ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
HAMELIN ..	1	1	1	1	..	..	..	1	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..
BUSSELTON ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
BUNBURY ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
ESPERANCE ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
TOTAL ..	21	52	6301	5839	402	402	150	6301	1408	..	2438	..	..	143	..	1014	440	308	..	..	..	..	88	..	..

DEPARTMENT OF AGRICULTURE,
6th August, 1901.

RETURN OF FRUIT TREES AND PLANTS IMPORTED INTO WESTERN AUSTRALIA DURING

JULY, 1901.

NAME OF PORT.	No. of Ships.	No. of Consign- ments of Trees or Plants.	Total No. of Trees or Plants in such Consignments.	No. of Consign- ments Passed.	Total No. of Trees or Plants in such Consignments.	No. of Consign- ments of Trees or Plants Prohibited.	Total No. of Trees or Plants in such Consignments.	No. of Packages Dipped.	No. of Trees.												All Other Trees		
									Ornamental & Pot Plants.	Almonds.	Apples.	Apricots.	Cherries.	Figs.	Lemons.	Limes.	Mulberries.	Oranges.	Peaches.	Pears.		Plums.	Small Fruits.	Vine Cuttings.
FERMANTEE ..	11	35	8713	25	8713	..	8713	58	3	2566	..	100	9	..	..	..	1725	850	245	200	4	..	557
ALBANY ..	8	12	6000	12	6000	..	6000	25	82	8840	105	13	18	117	..	..	70	489	501	461	..	..	54
GERALDTON ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
HAMELIN ..	1	1	90	1	90	..	90	1	6	34	6	..	..	2	..	..	2	7	..	27	..	..	6
BUSSETTON ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
BUNBURY ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
ESPERANCE ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
TOTAL ..	20	38	14803	38	14803	..	14803	84	3611	85	6440	201	113	24	119	..	1797	1346	746	891	4	..	617

DEPARTMENT OF AGRICULTURE,

6th August, 1901.



JOURNAL

OF THE

DEPARTMENT OF AGRICULTURE

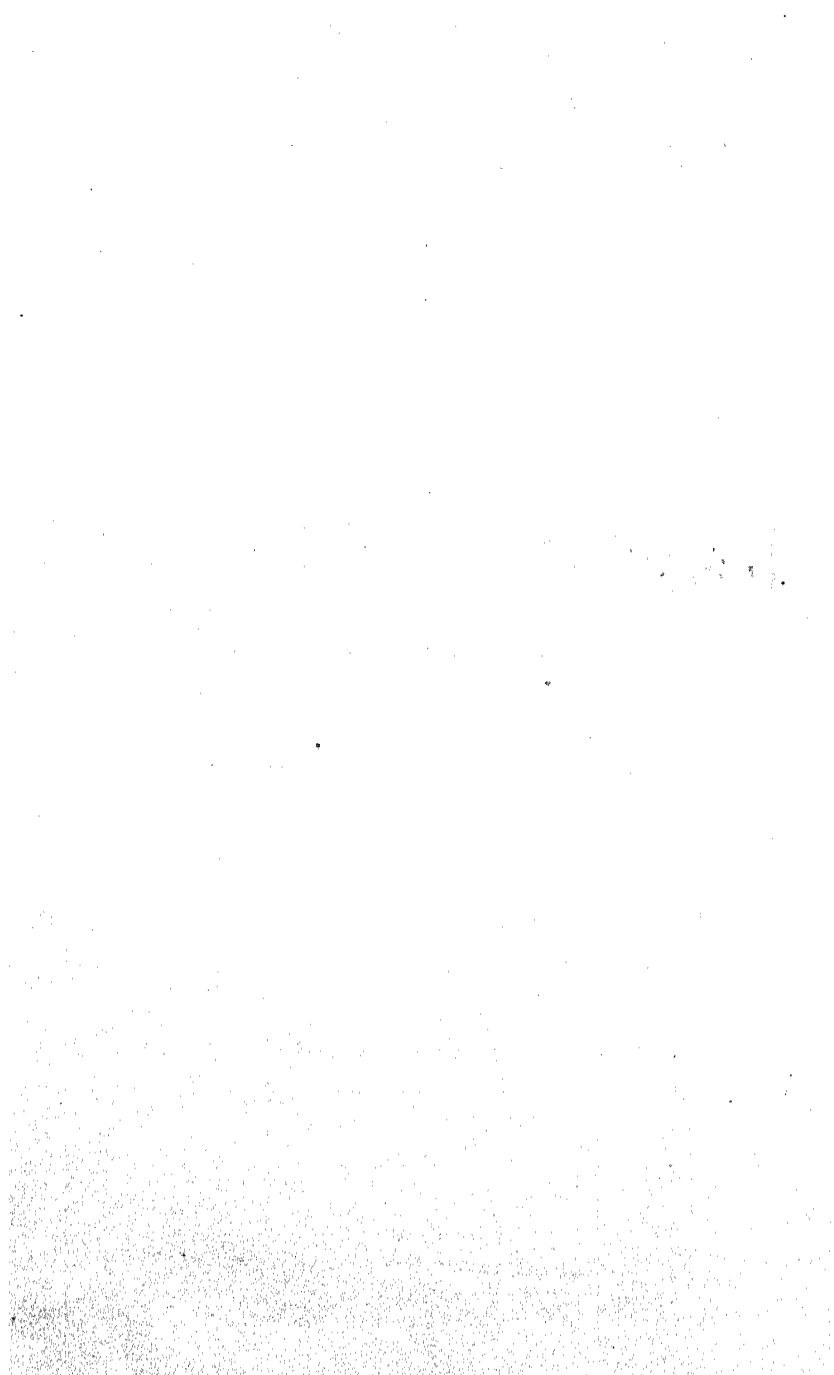
OF

WESTERN AUSTRALIA.

Vol. 4.—Part 3.

SEPTEMBER, 1901.

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1901.



NOTES.

MILKING MACHINE.—The milking machine is again coming to the front. A company has been organised at Trenton, New York, with a capital of £2,000,000, to undertake the manufacture and sale of milking machines.

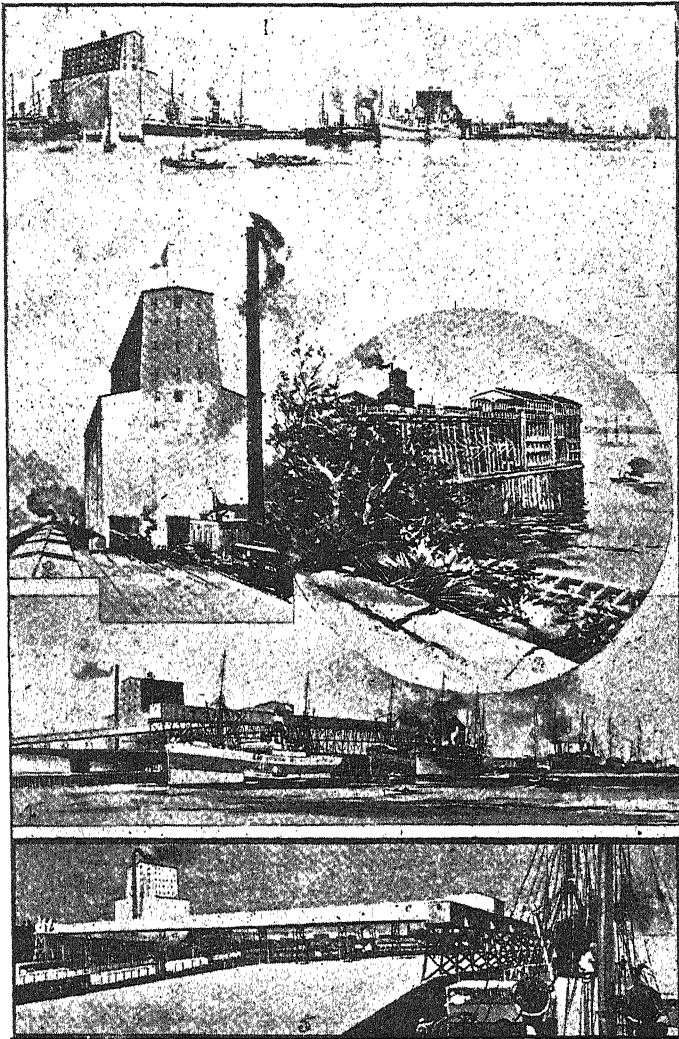
RAPE FOR FEED.—Very successful experiments have been made at Scone with growing rape for sheep fodder. A paddock of 100 acres at Brushy Hill, which, up to five years ago, was thickly infested with scrub, prickly pear, and wallabies, and was practically worthless, has been fattening 20 sheep to the acre for several months past.

A NEW RABBIT EXTERMINATOR.—A new agent is being tried in the Wentworth district (N.S.W.) for the extermination of the rabbits. Acetylene is put down the burrow as far as can be reached; all outlets are then sealed up; water is poured in on the carbide, and a match applied, with the result that the rodents are stifled in the burrows. It is believed that if a more efficient method of applying the gas to the warrens can be found acetylene will become a valuable factor in the extermination of "bunny."

APPLYING PARIS-GREEN TO POTATOES.—A correspondent to the *Rural New Yorker*, writes:—"Seemingly, in our efforts to destroy potato beetles, we have tried everything within the range of poisons, together with a great variety of methods of applying them, varying from a dusting box to a spray pump. Last season we hit on a little device that proved singularly simple, and very satisfactory on the whole. Two pieces of heavy coarse burlap cloth, each about two feet square, are used, the edges being gathered up in the hand. A piece of this burlap taken in each hand, and carried over each row of potatoes, will readily enable one to cover a small patch with plaster and Paris-green in a comparatively short time. Last season we used the prepared plaster and Paris-green, such as is sold commercially, with very satisfactory results. If one wish to prepare his own plaster it can be readily done, and used just as satisfactorily as the commercial stuff. In using dry plaster it is commonly best to put on early in the morning, when the vines are damp with dew. It will thus stick better, and commonly proves more effectual in destroying the beetles. In case of rain directly after applying I do not know that it will wash off any more readily than Paris-green applied in any other manner. We like to apply the poison just about the time the young are ready to put in their best work. Save in uncommon seasons we have succeeded in exterminating potato bugs quite effectually at one plastering."

LIME FOR FOWLS.—It has not been demonstrated that oyster shells, or lime in any form, produce egg shell (or rather shells for the egg), as there are thousands of hens that are in no manner provided with oyster shells. It is true, however, that oyster shells, being sharp, assist in grinding the food. Carbonate of lime is insoluble, and the lime for the egg shells must consequently come from what can be digested and conducted to the eggs through the blood. As nearly all kinds of food contain lime in a soluble form by combination with vegetable acids, as well as in the form of inorganic salts that are soluble, the process of covering the eggs with shells goes without the aid of substances that are insoluble. There is one source of soluble lime, however, that is frequently overlooked—the water—which holds lime in a soluble form when it abounds in carbonic acid. Hard limestone water contains lime, and the hens can, by drinking it, secure more lime in a convenient form than from oyster shells. When a hen lays eggs with soft shells the cause is due, not to the lack of lime, but to the condition of the hen, as she is then, as a rule, in an over-fat condition. To this cause may be traced all the eggs with soft shells.

SALT-BUSHES IN CALIFORNIA.—The value of the various species of salt-bushes indigenous to Australia have attracted the attention of stockraisers in various parts of the world, particularly in semi-desert lands. These plants have been tried in several localities where the conditions of life are not dissimilar to those of the native habitat of the plants. Generally speaking, the results, so far as I have been able to ascertain, are such as to ensure a high character for salt-bushes as pasture plants. An apparent exception comes from California. A short time back Mr. B. Walton, of Compton, wrote to the *Californian Cultivator* on the subject of Australian salt-bush. He says:—"A few years ago this plant was introduced as a fodder plant to be grown on alkali land. Since that time it has spread out along the roads and on all kinds of lands, is growing vigorously on the driest land, and, I think, promises to become a common weed. Will some of your readers be kind enough to inform our farmers what it is good for? One of my neighbours had a patch, and the turkeys, chickens, and his pig would eat it, but the cattle and horses would not. The salt-bush has taken to the field and roadsides, and bids fair to take possession. When it comes in contact with weeds or grass it just climbs over them, and I doubt if anything can stand against it." This is quite contrary to the experience of Australian stock-owners with salt-bushes. Many of them in this time of drought would gladly hail the presence of salt-bush as a common weed. If the Californian farmers have grown the true salt-bushes, the change in the nature of the plant must be ascribed to the influence of the environment. It is strange that we do not hear of any other plants being so completely altered in their useful qualities by the excess of alkali in the soil. The farmer, by the way, does not say that it is in the alkali soil that the salt-bushes are growing.



1. General view of the terminal elevators at Galveston, Texas, U.S.A. 2. Near view of the elevator shown in the extreme distance in No. 1—a grain train is seen just leaving the elevator. 3. Coal elevator at Tacoma, Washington, U.S.A. 4. General view of the elevator shown in No. 2, showing the long covered grain belts reaching from the elevator to the wharf, a distance of several hundred yards. 5. View of the same elevator from the top of a ship's mast. The courses of the grain belts are indicated by the letters *a, b, c, d*, passing over railways, store-houses, and other buildings.

See page 162

STERILISED AIR FOR FRUIT EXPORT.—*British Refrigeration* says that Prof. Long, speaking at the meeting of farmers in Cornwall, said :—" We have been accustomed for many years to refrigerated meat from Australasia and America, and now it appears we are to have fruit brought into this country under similar conditions. The fruit, so it is said, when imported will have lost nothing of its original freshness. The apparatus in which it will be conveyed consists of an air-tight storage room, in which fruit can be sealed up, the atmospheric air driven out, and a sterilised atmosphere made to take its place. The latter is easily and cheaply produced, while the required temperature is secured with one-fourth the expenditure of power necessitated for the ordinary process of refrigeration. It is claimed for the invention, after being tested, that fruit can be picked ripe, placed in the chamber, and conveyed to this country from any part of the world in a perfectly fresh state."

DR. KOCH'S DECLARATION AS TO TUBERCULOSIS.—The result of the British Congress on Tuberculosis is very different to that which was expected. Dr. Koch, the eminent German specialist (who has devoted so much of his attention to this subject, and on whose discoveries the whole modern treatment of tuberculosis has been built up) recently delivered an address which created a decided sensation. It appears that he has always been doubtful as to the identity of tuberculosis in man and animals, while he has recently proved by repeated experiments that the disease cannot be communicated from man to animals. After describing these experiments, he said : " Considering all these facts, I feel justified in maintaining that human tuberculosis differs from bovine, and cannot be transmitted to cattle." It is, of course, impossible to experiment in the same way as to the communicability of the disease from animals to man, but Dr. Koch made this noteworthy declaration :—" Though the important question whether man is susceptible to bovine tuberculosis at all is not absolutely decided, and will not admit of absolute decision to-day or to-morrow, one is nevertheless already at liberty to say, that if such a susceptibility really exists, the infection of human beings is of very rare occurrence. I should estimate the extent of infection by the milk and flesh of tubercular cattle, and the butter made of their milk, as hardly greater than that of hereditary transmission, and I, therefore, do not deem it advisable to take any measures against it." As might be expected, these declarations have caused considerable difference of opinion, and a number of scientific men have expressed dissent from them. They are certain to exercise great influence in the methods of dealing with the disease.—*Agricultural Gazette*.

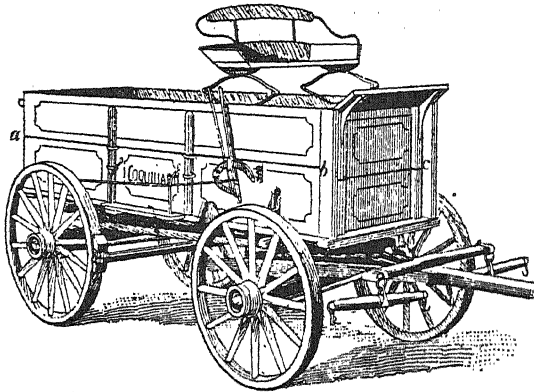
An acre of land will carry 125 hens comfortable if allowed free range; 250 head if the land is divided into pens and managed properly.

GRAIN IN BULK.

BY PERCY G. WICKEN.

An interesting experiment, which marks a new era in the handling of grain in the Australian States, was recently carried out in Sydney, N.S.W., when a quantity of wheat was loaded into the mammoth steamship "Persic" in bulk, by means of a temporary elevator erected under the direction of the Board of Exports for the purpose of testing this method of carrying wheat. Although wheat has been carried in bulk in the U.S.A. for some time past, nothing of the sort has been attempted in Australia, owing no doubt to the fact that such small quantities have been available for export.

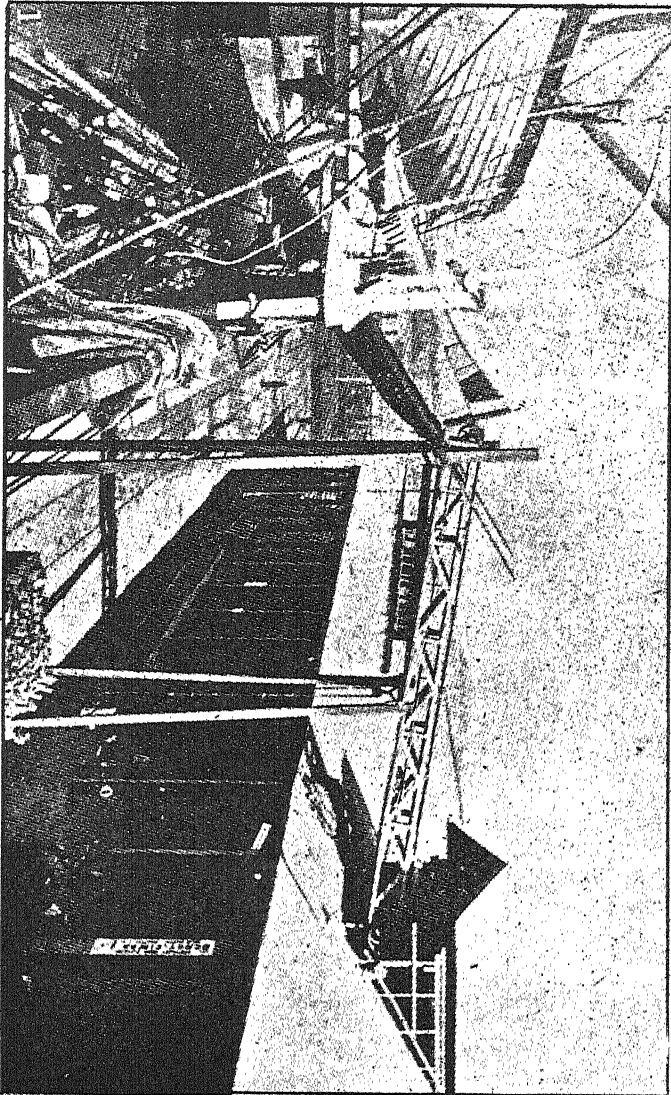
Now that the yield of wheat is largely increasing, and that N.S.W. within the last two years has become an exporter instead of an importer of wheat, it behoves those concerned in the trade to look out for the cheapest method of handling grain, so as to enable them to compete in the world's markets against those who work under much greater advantages as to freight and carriage than we are enabled to do in these States.



GRAIN WAGON AS USED IN MINNESOTA.

The top part above *a* and *b* can be removed when not required and the wagon used as a kind of express wagon.

The wheat in question was loaded loose into the ship's hold by means of an elevator temporarily erected for the occasion, and was consigned by the Co-operative Wholesale Company, to its London agency. The cost of the belting, shafting, and the elevator shafts was about £240, the engine power was lent by the Public Works Department. Work was started on July 18th, when a gang of men emptied sacks of grain, brought from the grain districts by rail into the feeder bins, whence a rotating band of buckets raised the bulk wheat and spilt it in a steady stream on the flat upper



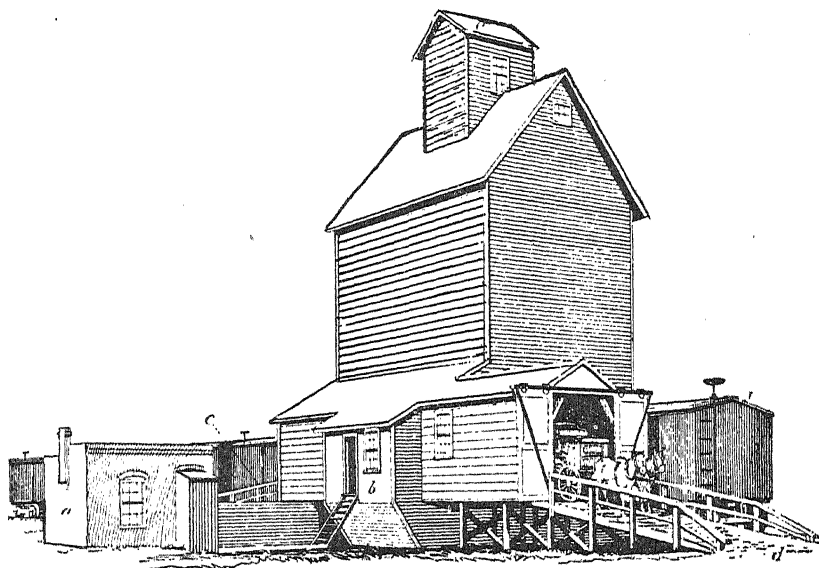
LOADING WHEAT, S. S. "PERSIC"—GENERAL VIEW OF THE ELEVATOR.

See page 102.

surface of an endless leather belt, moving continually at a high elevation towards a shoot. The grain passed through the shoot and poured into the hold of the steamer. The grain, of which there was 1,130 tons, was shipped at the rate of over 80 tons an hour. The shipment, which represents about 12,000 bags, was thus put on board the vessel in about 14 hours.

But the chief interest will, of course, centre in the question as to how the wheat will stand the voyage, and to what extent it will reduce the cost of freight and the expense of handling the grain. A report on this subject is anxiously waited for by those interested in the trade, and if successful is likely to revolutionise our methods of dealing with grain.

In the U.S.A. grain is mostly carried on the railways in bulk, and is taken by the farmer to the elevator in a box wagon, as shown in the illustration, and is there taken in hand and cleaned and graded at a low rate per bushel, or purchased outright. It is



TYPICAL COUNTRY UP-TO-DATE ELEVATOR.

a Power house. *b* receiving office. *c* entrance. *d* exit. *e* top of elevating belt. *f* grain cars receiving grain.

then shipped by train in specially constructed cars (as shown in illustration page 175) to the terminal elevators at the port of shipment, whence it is placed in bulk in the ships' holds. In a recent report by Dr. N. A. Cobb, of the New South Wales Department of Agriculture, who recently visited America for the purpose of furnishing a report on this matter, he estimated that there are between 15,000 and 20,000 elevators at work in the United States, some single States containing as many as 2,000.

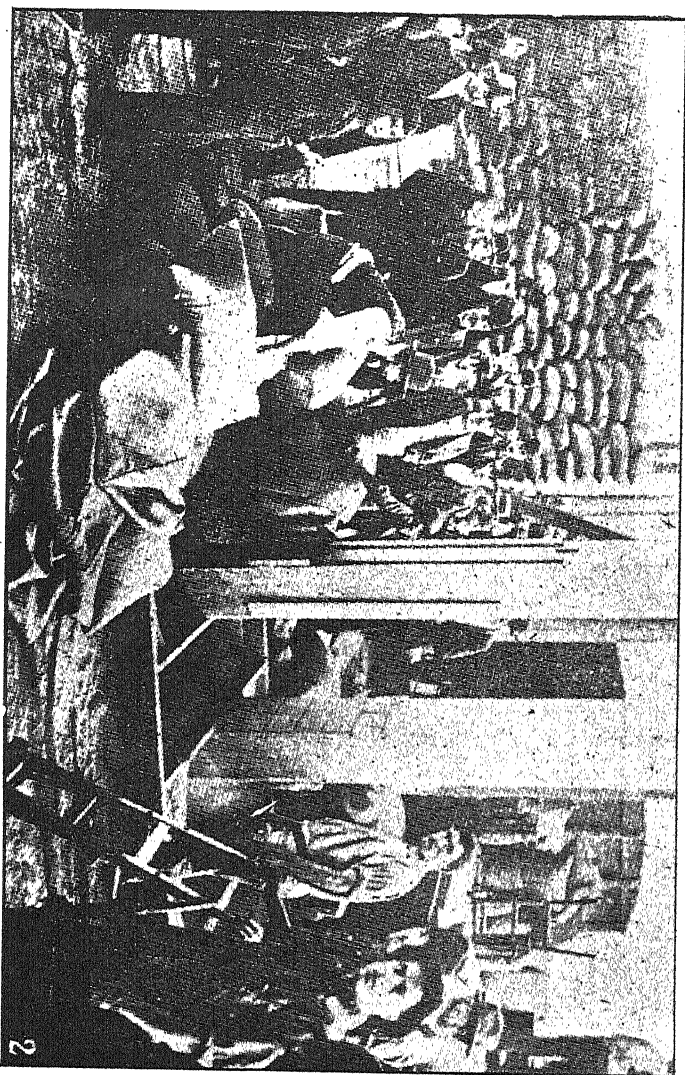
These elevators are mostly owned by private companies who compete with each other for the handling of the grain in a very energetic manner. The average charges by the terminal elevators are $\frac{3}{4}$ cent per bushel for receiving, $\frac{1}{2}$ cent per bushel for cleaning, and no charge for shipping. These rates include fifteen days storage free of charge, and $\frac{1}{2}$ cent per bushel for every additional fifteen days storage is charged, until the total amount reaches 6 cents, after which the grain is stored free for the remainder of the year.

On the wheat being received at the elevator a check is given to the sender stating the grade and quantity of the wheat received, and on presenting this check at a future date the owner of the wheat is entitled to receive an equal quantity of grain of the same quality, or the standard market price ruling at any time that he wishes to present his checks. Storage checks are offered and accepted as security in case the farmer wishes to borrow money while waiting for the price of grain to rise to the figure at which he expects to sell. The maximum rates and charges for receiving, insuring, handling, storing for fifteen days, and delivering to order is 2 cents per bushel. The country elevators average from 20,000 to 40,000 bushels capacity, while the terminal elevators run from 200,000 to several million bushels capacity.

To show the extent to which the use of elevators is carried, we can take the city of Minneapolis as an example, which has a population of 200,000, and possesses 30 elevators, having a capacity of 27,500,000 bushels, and capable of receiving 1,500 car loads of grain per day (a car load contains 800 bushels). These elevators could receive, grade and deliver the annual wheat crop of N.S.W. or Victoria in about five days. The elevators in Minneapolis are terminal elevators, and the grain is brought in by trains of specially constructed cars, and unloaded into the elevators, from whence it is loaded into the holds of the ship. One great saving to the farmer by the use of the elevator system of handling grain is the saving of the large amount of money annually sent out of the State for the purchase of corn sacks, which may be roughly estimated at 2d. per bushel of wheat produced. Last year the amount of money sent out of this State for purchase of corn sacks and other bags amounted to £30,012.

Wheat is not the only grain that can be dealt with by means of the elevator—oats, barley, rye, maize, even coal and road metal are handled by the same method with success, and at a great saving in the cost of labor and transport.

A fowl should not be eaten on the day that it is killed. The most tender chicken will be tough as soon as the animal heat has left the body; but twelve hours after death the muscles relax, and it becomes fit for food. Black-legged fowls for roasting, white-legged ones for boiling, was an English opinion in 1850.



LOADING WHEAT, S.S. "PERSIC"—FEEDING GRAIN INTO THE ELEVATOR

See page 162.



VALUABLE GRASSES.

REPORT ON THREE PASPALUM GRASSES.

BY A. CRAWFORD.

On all sides there seems to be a general desire on the part of the farmers of this State to try and improve their grass lands, and some of the seed merchants tell me they have sold more grass seed this year than they have in the past two or three years. Among the grasses that there has been the greatest demand for is the *Paspalum Dilatatum*, some farmers having ordered several hundred-weight of it. It is to be regretted that there seems to be so much trouble in getting this seed to grow. One farmer not long since informed me that he planted 20 pounds of it, and that he did not have more than a dozen plants of it come up. It is very delicate after it first germinates, and is easily killed off, either by frost or wet, for the first week or two; after that it is one of the hardiest of our grass plants. It will stand heat or cold, wet or dry. Last spring I saw some of it that had been under water about 2 feet deep for over three months, and the water at the time I saw it was quite a foot deep on it. It was then most vigorous, and had sent up shoots above the water. It will stand severe frost. I have it growing in my garden, and morning after morning during the past winter the frost has been thick upon it, and it is fresh and green and growing slowly. It makes but little growth in the winter months, but once the days begin to lengthen and the sun's rays stronger, it grows rapidly, and the best point is that it keeps growing all the summer through. It seems to be more suited for loose loamy or sandy soils, where it can send its roots down to a great distance. Last year I was taking up some plants that had been grown from seed the previous year, and some of the roots measured 22 inches in length, and had broken off at that. If the whole root had been got out it would have been at least 30 inches in depth. This was in a pure white sand. Last spring I planted out a number of roots in some of the stiffest clay I could find. The clay is so stiff that in the summer it bakes just like a brick, and can only be broken up by a pick, and even then it will only break up in pieces like a coarse gravel. The plants were all sets taken from one large root. Seventy-five sets were obtained from the one root, and all grew but one. There was no attention given to the plants during the summer, either by cultivation or watering. Some were in a fowl pen, and others were in the garden. Those in the fowl pen were kept eaten down by the fowls, but there was always a green growth the whole summer through. The ones that were in the garden grew to about 3 feet high, and were cut down twice after they had seeded each time. At the end of summer they were green and vigorous, although the ground around was as hard as a metal road.

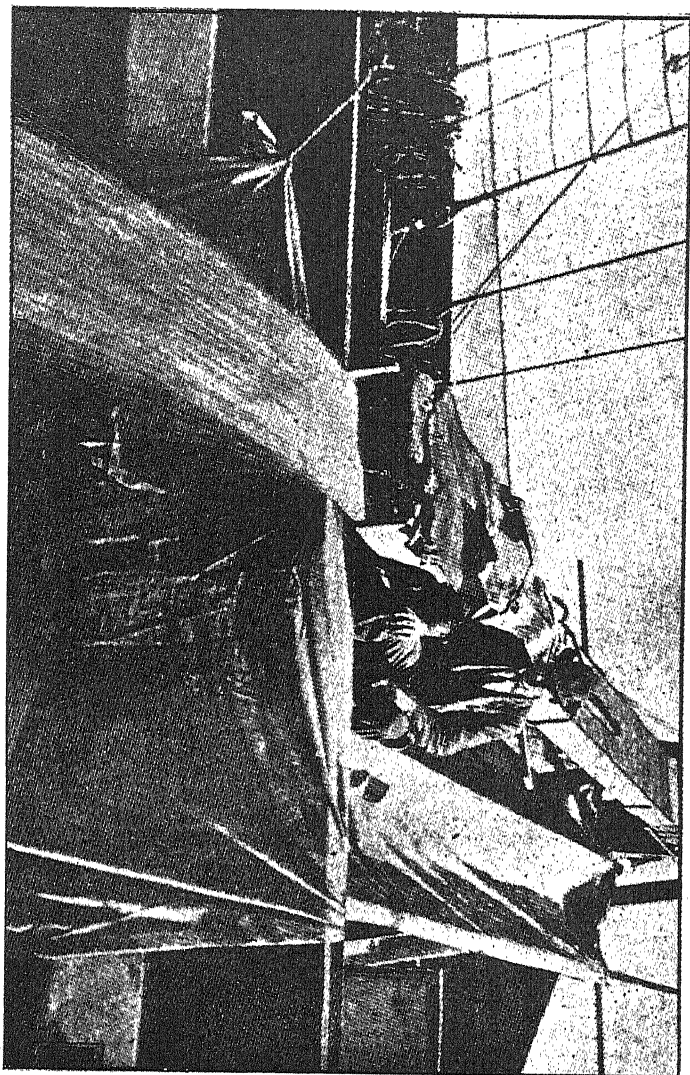
During this past winter I lifted up one or two of the plants, and found that the roots had gone down about 12 inches in the

clay, and the roots were remarkably abundant, being about twice as large as the plant itself. From the result of the experiments that I have made during the past four years, I am quite convinced that, so far as that part of the country lying between the Darling range and the sea coast from Geraldton to Albany is concerned, the *Paspalum Dilatatum* will thrive and flourish in it.

The country that is now looked upon as utterly useless except to grow banksias on for firewood, I am satisfied, can all be turned into good pasture land that will carry great herds of cattle, sheep, or horses. Anyone who wishes to get a good start with it cannot do better than get roots and subdivide them into sets, planting them from 18 inches to 3 feet apart. If planted like this and allowed to seed it will soon fill up the gaps and cover the whole ground. The roots are not obtainable in this State in any numbers, but can easily be obtained in New South Wales at a very moderate price per thousand. They carry over here fairly well, several consignments having been imported this season, and already they are shooting out.

Last season Mr. Berthoud, Manager of the Experimental Plots at Drakesbrook, got a few seeds from Paris of a new *Paspalum* (the *virgatum*), these he planted, and the growth was something wonderful, by the end of summer the plants had attained a height of over 6 feet, and over 5 feet in circumference. It seeded freely, and the stalks and leaves were not at all coarse, but fine, soft, and succulent, and seemed excellent fodder. Its habit of growth is much more upright than the *dilatatum*, and if hay was desired would be easier grown than the former. It is said to be quite equal to the *dilatatum* in its drought-resisting qualities. As the experiment at Drakesbrook is not a fair test, I have sent roots of it to a number of different districts, and also some of the seed, and hope to be able to give a satisfactory report on it by this time next year. It seeded very freely at Drakesbrook, and a fair quantity of it was saved. So far as I can find out it is not obtainable from any of the seedsmen in Australia, and the only catalogue I have seen it mentioned in is that of Vilmorin's, of Paris, from whom we got some more seed this season. It seems to be a very scarce and rare plant judging from the price of the seed, being something like 5s. an ounce.

There is another *Paspalum* that is remarkably highly spoken of in Queensland as a drought resister—the *Paspalum Platycaule*. We were fortunate in being able to get a few roots, although no seed was available—they have been planted, some at Drakesbrook and some at Guildford. Like most of the *Paspalums* it is also a summer grass, and although it has now been planted over two months, only one tiny leaf has yet appeared. In habit of growth it resembles couch, being a creeping grass, and rooting from the joints. It ought to be a good grass for dry districts judging from its abundant roots. There is one thing about it that will need careful watching, that is that it may be a very difficult grass to get rid of, and, if planted in agricultural ground, might in time become



LOADING WHEAT, S.S. "PERSIC"—GRAIN POURING OUT OF THE ELEVATOR.
See page 165.

a nuisance, as bad or even worse than couch. However this is but conjecture, and it remains to be tested by actual experiment, and that will take another two or three years, as only a few roots were to be obtained, and these can only be experimented with at the two places, Drakesbrook and Guildford, this season. If it fulfils its reputation it ought to be a splendid grass for the North-West and North, or even the back Eastern districts.

These three *Paspalums* are distinguished by their habit of growth, the *Virgatum* being erect, the *Dilatatum* semi-erect, and the *Platycaule* creeping.

THREE WAYS OF FEEDING MILK TO CALVES.

Twenty head of grade Shorthorn and Hereford calves were purchased by the Kansas Experiment Station in the spring of 1900 and divided into two lots. One lot was fed on sterilized creamery skim-milk, with a grain ration composed of equal parts of corn and Kafir-corn meal, with all the alfalfa hay they would eat. The second lot was fed the same as the first, except that fresh whole milk was used instead of skim-milk. In addition to these two lots the station secured the privilege of weighing 22 head of high-grade Hereford calves which were running with their dams in a pasture near the Experiment Station.

RESULTS WITH SKIM-MILK.—For the 22 weeks under experiment the 10 calves consumed 24,736 pounds of skim-milk, 1,430 pounds of corn chop, 1,430 pounds of Kafir-corn meal, and 641 pounds of alfalfa hay. The total gain was 2,331 pounds, or a daily average of 1.51 pounds per head. Figuring skim-milk at 15 cents (7½d.) per 100, grain at 50 cents (2s. 1d.) per 100 pounds, and hay at \$4 (16s. 8d.) per ton, the total feed cost of raising these calves was \$52.68 (£10 19s. 6d.), or \$5.27 (£1 1s. 11½d.) per head. The feed cost for each 100 pounds of gain was \$2.26 (9s. 5d.)

Cows that are milked will produce larger yields than when suckling calves. According to the average yield at this station, 10 cows (one for each calf) produced 55,540 pounds of milk, testing 3.93 per cent. butter fat. With butter fat at 15½ cents (7¾d.) per pound, this would amount to \$338.52 (£70 10s. 6d.) The value of the skim-milk not needed by the calves would raise this to \$374.24 (£72 19s. 4d.) Deduct from this the value of the feed consumed by the calves, and there remains \$321.56 (£66 19s. 10d.), or \$32.15 (£6 13s. 11½d.) per calf to pay for the expense of milking, feeding the calves, and hauling the milk to the creamery. At 12½ cents (6¼d.) per hour this expense need not be one-half of the above sum, leaving \$15 (£3 2s. 6d.) to \$16 (£3 6s. 8d.) clear profit for each calf raised on skim-milk.

RESULTS WITH WHOLE MILK.—During 22 weeks these 10 calves consumed 23,287 pounds of fresh milk, 835 pounds of corn chop, 835 pounds of Kafir-corn meal, and 835 pounds of alfalfa hay. The total gain was 2,878 pounds, or a daily average of 1.95 pounds per head. Charging butter fat at creamery prices, the feed cost of raising these calves amounts to \$157.19 (£32 14s. 11½d.), or \$15.72 (£3 5s. 6d.) per head. The feed cost for each 100 pounds of gain amounts to \$5.46 (£1 2s. 9d.)

RESULTS WITH CALVES NURSED BY THE COWS.—On May 28, 1900, 22 calves that were running with their dams averaged 174 pounds. On October 15 these same calves averaged 422 pounds, or an average daily gain per head of 1.77 pounds. The only expense attached to raising these calves was the keep of the cows, which was estimated by the owner to be \$12 (£2 10s.) per head. Multiplying the average daily gain of these calves by 154, the number of days in previous experiment, gives a total gain of 272 pounds per head. With \$12 (£2 10s.) as the cost of raising the calf each 100 pounds of gain cost \$4.41 (18s. 4½d.)

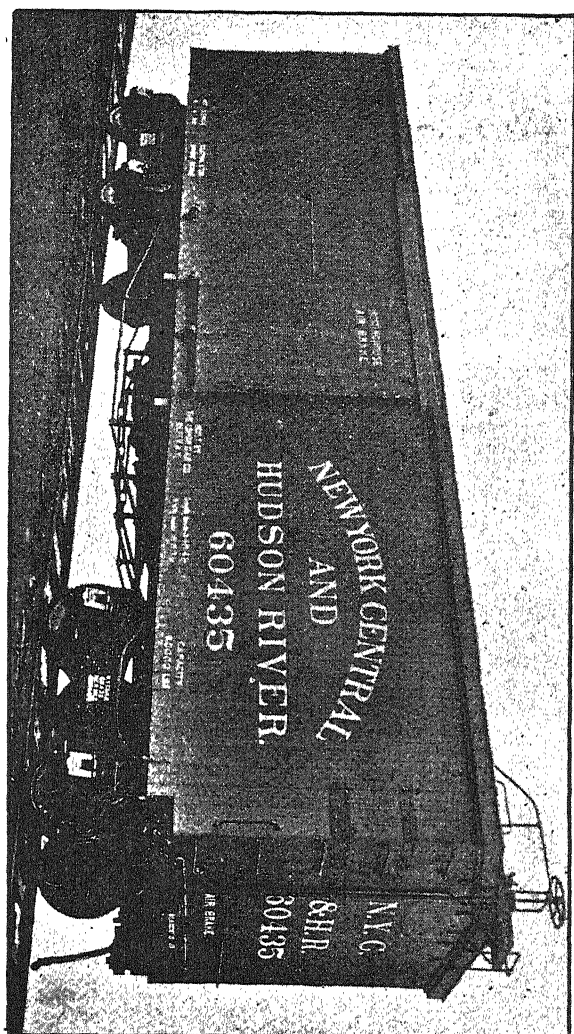
RESULTS IN FEED LOT AFTER WEANING.—In the fall all these calves were placed in the feed lot, where they were pushed for baby beef. During the seven months under experiment the skim-milk calves gained 440 pounds per head, the whole-milk calves 405 pounds per head, and the calves nursed by the cows 422 pounds per head.

This experiment shows that the feed cost of raising a good skim-milk calf need not exceed \$5.25 (£1 1s. 10½d.), in contrast to \$15.75 (£3 5s. 7½d.) for a whole-milk calf, and \$8 (£1 13s. 4d.) for one nursed by the dam. The skim-milk calf becomes accustomed to eating both grain and roughness early in life, is handled enough to be gentle, and when transferred to the feed lot is ready to make rapid and economical gains.

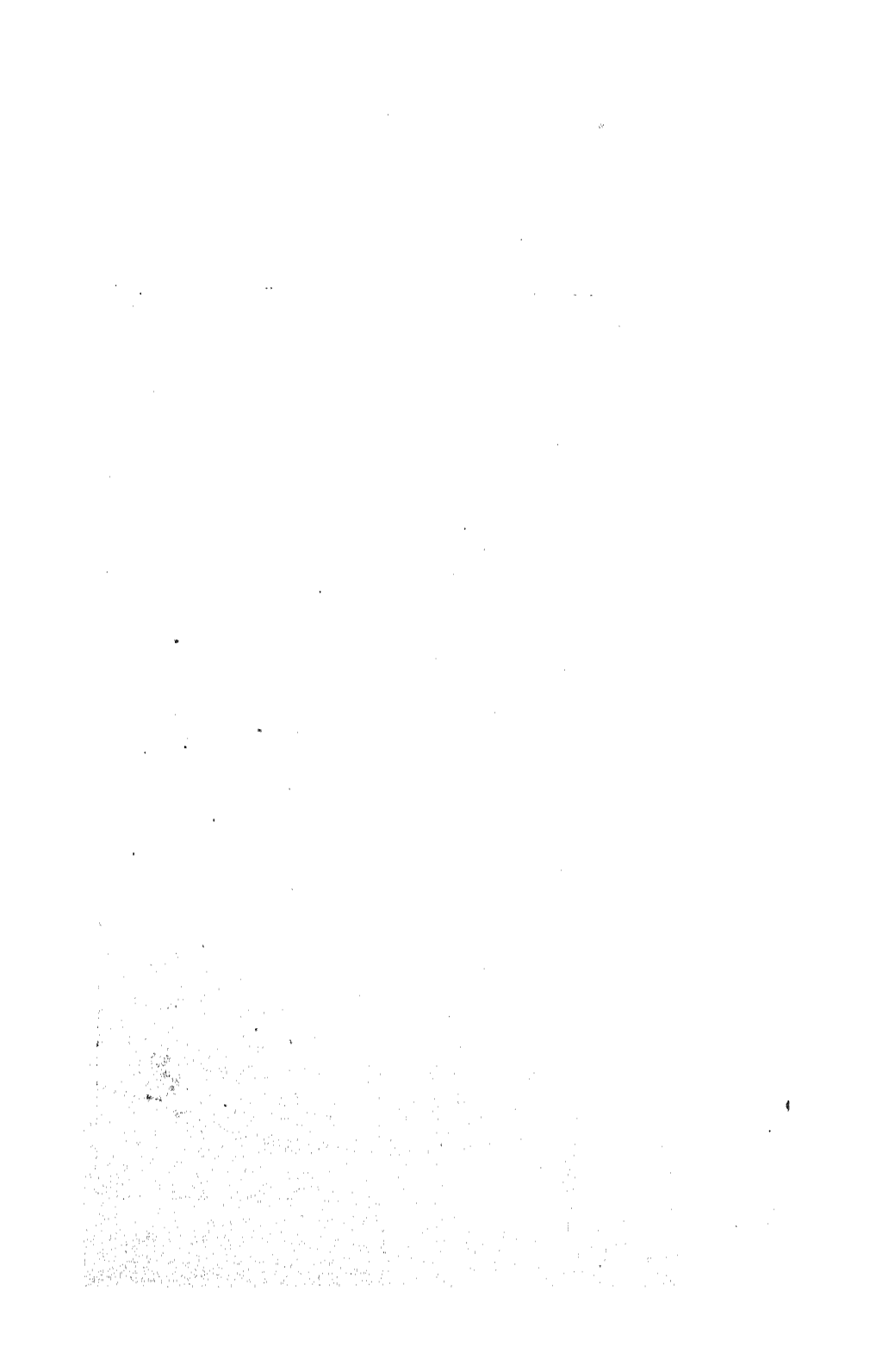
D. H. OTIS, Experiment Station, Manhattan, Kan.

The breed of fowls that has the greatest demand in the meat market should be the one that brings the highest price in the thoroughbred market. Fine feathers, large combs, white ear lobes, etc., are all very nice in their place—but we cannot eat them.

Fowl lice hatch at the end of five or six days, and reproduce at end of 18 days. "Leewinenhoek" calculated that two females might become the grandmothers of 210,000 lice in eight weeks. An *Acarus (Dermanyssus avium)* is found on birds, and multiplies with such rapidity that it completely exhausts those on which it has established itself. *Sarcoptes mutans* prefers to live under the scales of the legs and feet of fowls. It has been found to pass from the fowls to the horse and other domestic animals. Reptiles are not free from its attacks, for it has been found on lizards and snakes.



BOX CAR USED FOR CARRYING GRAIN IN BULK.
See page 166.



THE INSECTIVOROUS BIRDS OF WESTERN AUSTRALIA.

BY ROBERT HALL.

MAGPIES AND MAGPIE-LARK.

European Ornithologists sometimes talk of our Magpies as Piping Crows, and it seems very reasonable that such should be the case. The crow, as we know it, is not a piper, but it has the most developed organ of voice of all birds, and accordingly it should be expected to be most musical. However, of this latter we are quite convinced to the contrary, notwithstanding its special set of muscles. Seeing our Magpie is so close to the crow, structurally, and knowing its vocal power, it is but natural the bird should be spoken of as a Piping-crow. One might well say a magpie is a glorified crow, if the term dignified and exalted is allowed to explain the meaning. Where can we find a more intelligent bird than the crow, and a greater combination of ornament and intelligence than is in the magpie? It adorns a field, enlivens a neighbourhood, and helps to subject with its strong beak many an insect that is not beneficial to the dairying and fruit growing industries. In fact, dairy farmers may well offer their protection, as low lying grounds harbor grubs that are much better away, and which are kept in subjection by magpies and other birds.

Under the sub-family *Gymnorhinae* of the *Laniidae*, or "Crow-shrikes," there are 13 species recorded for Australia and Tasmania. Of these four have been said to belong to the genus *Gymnorhina*, one of which (*G. hyperleuca*) occurs in Tasmania; a second (*G. dorsalis*) in Western Australia, while the remaining two, our common magpies, are to be found widely distributed over the Australian continent. That the genus is restricted to Australia there is no doubt, but that it has four species is a question now concentrated on one species. A few weeks ago the present writer supplied notes to show that the genus was represented by one species only, with one variety and innumerable specimens undergoing modification.

Briefly it has been said the "White-backed" species is different to the "Black-backed" in the region of the back; the lesser White-backed species (Tasmania) is smaller than the White-backed species; the Long-billed species (of this State) has a longer and slenderer bill than any other of the genus.

In placing the Magpie-lark with the Magpie it is simply a matter of convenience until such time as we know its true systematic position. In many respects they are not unlike. Both are insectivorous and keep to the same country, and in a number of cases are popularly referred to as the great and little magpies. Where interests do not clash, but rather work together, it is not unreasonable to speak at the one time of birds bearing a general life-like appearance, and having a habit common to each. The Magpie-lark is decidedly more fond of water than the larger bird.

MAGPIE (White-backed Crow-Shrike.)

Gymnorhina leuconota, Gld. (*Jim-nō-rī'nā lū-ko-no'ta.*)*Gummos*, naked; *rhinus*, nostril; *leukos*, white; *noton*, back.*Gymnorhina leuconota*, Gould, "Birds of Australia," fol. vol. ii., pl. 47. "Key to the Birds of Australia." Hall, p. 31 (1899).

GEOGRAPHICAL DISTRIBUTION.—Australia (scarce in the northern portion) and Tasmania.

KEY TO THE SPECIES.—Adult male: Whole of back pure white, like neck and rump; throat and breast black; bill pointed and slightly hooked; nostrils bare of feathers, and placed about the middle of the bill (longitudinal slit). Adult female: Similar to the male; back not so white. Young: Whole of back clouded with grey.



MAGPIE (White-backed Crow-Shrike.)

Magpies are not always gregarious. They mate for life, and families of two to five are generally to be seen, as if governing a small area. Sometimes a pair, or the occupiers of a block, will not breed for a year, but they join the multitude in the following summer. Though magpies are said to be fond of wheat, they are

trebly drawn to the luscious grasshopper, a horde of which they will attack in a most beneficial way for the agriculturist. When a season is poor in insect life young magpies die in their nests.

In my notes on magpies I find the young birds have as much wish to stay with the parents throughout the spring as young albatrosses have, but it is not allowable in the former case. The keen observations of Mr. Geo. Graham, recorded in his letters to me of August, 1898, state clearly (with small additions by the writer) the case of forced individual migration:—"Three out of seven families that occupy my paddocks have with them each a bird of last season's breeding, and to all appearances it intends to stay with them throughout the summer. When the next brood is incubated the family will increase from three to five. Providing there are no accidents it remains till about next May, when one disappears, and shortly after another goes. At this time there is a deal of chasing among the magpies, and I have concluded that it is the young male that is being driven away. The young male becomes blacker and darkens sooner than the female; as well as I can judge, I think the parent male would not permit the opposite sexed young also to remain in camp during spring, so the junior male has to go. If the young male should be allowed to remain with the parents into the next season it does not mate during its first year. I have also noticed the adult females of two families trying to drive away the young females by repeated attacks of sometimes 30 minutes' duration. The old bird would pin the young one to the ground, but it seemed to have no other effect than to make the young one afraid of its mother. The male parent stands by looking on, and takes no actual physical part in the contest. In both cases the youngsters stood the ill-treatment till the duty of nest-building compelled the 'dame' to leave them in possession. After the young of the new brood are hatched out it is amusing to see the dejected attitude of the oldest daughter (unmarried) when the mother happens to approach it in quest of food for the new brood. In May or June following it disappears, and probably begins housekeeping on its own account. Just at this time a new patch of forest has been opened up, and, if only of a few acres, a pair of magpies will find their way into it. But all is not complete yet, as someone has shot the male because it thrashed his domestic fowls. The female cleared out at once, and returned in a few days with four males, the strongest and best fighter eventually becoming her mate." It is interesting to direct a field-glass on a parent bird with a nest of young. You can see it fill the mouth with insects almost to bill-overflowing, then fly into the nest and equally distribute the collection to the young. I think young magpies must be trained to catch snakes, and that it is not intuition with them. Proof to this effect is not strong, but a bird I know in domestication almost went into hysterics one day when an unassuming lady visitor came in with a boa dangling from her neck. The bird got a terrific fright, screeched, and hid itself for nearly three hours.

My friend, Mr. W. J. Stephen, has a female bird, taken from a nest four years ago, which is a splendid talker. In the spring of 1897 an inclination to sit was observed. The following year (August, as with wild birds) it showed a similar desire, and some assistance was given as soon as it showed itself in earnest. Both Mr. and Mrs. Stephen were good enough to keep a rough diary for me of the nest-building, which shows how the bird, in spite of being turned out of its nest several times, persisted to build, using for preference pieces of wire, stiff twigs, and also some strips of stiff white calico, but rejecting pink flannelette.

I know a semi-domesticated pair of birds that have lived and reared their young in a garden for five consecutive years. They added to and renovated their first nest up to the third year, and built another for the fourth year. This I know by the broken leg the male bird has had from the beginning of 1893. A pair of this species has reared three families of young without any black pigment in their plumage. But these albinos do not seem to live long in captivity.

At Lawlers there is a pair that has resided for 20 years, breeding only during four seasons; the young were shot, or left the district. Here the Magpie is practically absent, while at Cue and Mount Magnet they appear also to be absent. At Geraldton, and further south they are numerous.

Nest.—Cup-shaped; large; formed of sticks externally, grasses and hair internally, and nicely lined; placed high or low, according to the size of tree available.

Eggs.—They vary considerably in colour. The ground colour may be light green, light brown, or of intermediate shades; the markings may be streaks and blotches of chestnut, reddish brown, or varying brown; some will be heavily blotched, others will be lightly so. Clutch, three to four. Length, 1.5 inches; breadth, 1 inch.

BLACK-BACKED MAGPIE (Piping-Crow Shrike).

Gymnorhina tibicen, Lath., variety of *G. leuconota*, Gld. (*Jim-no-rî'nû ti-bi'sen*).

Gummos, naked; *rhinus*, nostril; *tibia*, flute; *canere*, to chant.

Gymnorhina tibicen, Gould, "Birds of Australia," fol., vol. ii., pl. 46. "Key to the Birds of Australia," Hall, p. 31 (1899).

GEOGRAPHICAL DISTRIBUTION.—Areas 9, 7, 6, 3.

KEY TO THE VARIETY.—A broad or narrow black band across white back; throat and vest black; bill pointed and slightly hooked; nostrils bare of feathers, and placed as longitudinal slits about the middle of the bill.

Viewing this bird from the popular and scientific standpoints, there is scarcely another so interesting. During certain times, as when the seed grain is in the ground; the "Pies" are not in favor with every cereal grower. That it destroys the prospect of a crop

at such time is not real to me, although the evidence of a stomach full of grain certainly weighs against its good name. Soft-bodied injurious vermin are very much reduced in number at the same time. Those of us who devote some little attention to bird life differ in opinion as to whether it is a species or a variety of a species. It may be a case of paralled development. For eleven months of the year the bird is indispensable to the grower, doing what other birds never do, and eventually adding its quota to the handsome results the quality of the ground, with a minimum of pests, has given. The true position of the "Black-back" in this State has not yet been ascertained, and much needs to be done in the working out of this and other life histories.



BLACK-BACKED MAGPIE (Piping Crow-shrike).

The question is often asked why the "'Pies" fly at passers-by in and out of season.

Magpies fly at one for a reason similar to that of a hen with its chicks in danger. The male bird, and not the female, seems to be the attacker of man, and the attacked is not only a man, woman, or child, but may be a dog or a species of small bird, or, as is better known, a hawk or crow. Small birds, as Robins and Tits, that are breeding at the same time as the Magpie, may have their nests pulled to pieces, the young destroyed, or even the old birds, if they

can be caught. It is in this respect a brutal bird. Both male and female attack hawks. The magpies fly desperately at one when either eggs or young are in the nest, as well as when the latter have recently left the nest, but later their pugnacity ceases. In individual cases the Magpie will keep the pugnacious temperament very strong for some weeks, or even months, and woe betide us if we should meet such a hot-tempered bird. In breeding season it recognises its arch-enemy, man, whether on horseback or in the buggy, and, far beyond a quarter of a mile from its nest, will follow him and endeavour to make war with him. The Black-breasted Plover will fly at dogs for protection of its eggs, just as the Magpie will fly at a crow for a like reason. I should say the bird has learnt by direct experience (not instinct) to regard mankind in the light of an enemy; experience, because in the remote and sparsely populated districts, where the birds are not subject to the persecutions of schoolboys or other egg-hunters, they are of a much milder disposition. As we approach the towns their ferocity increases.

Nest.—Similar in every way to *G. leuconota*. Both are placed in the forks of perpendicular branches.

Eggs.—The specimens taken from five different nests show very varying differences. The ground colour will be pale green or brown. The spots may be lilac or chestnut, and the streaks of the same. Clutch, three; length, 1.5 inch; breadth, 1.1 inch.

SALTING BUTTER.

It is a fact known to advanced butter-makers (says the *Farmers Review*) that adding salt to butter drives out the moisture. A butter-maker cannot, therefore, figure correctly on weighing the butter before salting, weighing the salt and adding to get weight. The claim that salt is sold at butter prices to the consumer will not stand. Butter unsalted, contains more water than the same butter salted. Recent experiments at one of the dairy schools gave the following results:—Butter salted at the rate of one-quarter ounce to the pound, one-half ounce, three-quarter ounces, and one ounce of salt per pound of butter, contained respectively, 11.292, 10.47, 9.802, and 9.472 per cent. of moisture, while similar butters, to which no salt was added, contained an average of 12.377 per cent. moisture. Also butter salted with "paste" (wet salt) contained an average of 10.55 per cent. moisture, while butter from the same churnings, handled in exactly the same way, except that the salt was applied in the dry form, contained an average of 10.75 per cent. of moisture in the finished butter. Butter worked by giving the worker twenty revolutions, contained an average of 12.34 per cent. of moisture, and similar butter, worked with thirty revolutions, contained an average of 12.34 per cent. of moisture.

FROM PORT HEDLAND TO CARNARVON BY BUGGY.

BY DAISY M. BATES.

Superstitious folks aver that to start any work or journey on a Friday invites bad luck ; and therefore, according to their "ethics," all the accidents by flood and field which befell me on my journey from Cossack to Port Hedland, and thence to Carnarvon, are attributable to my having began my tour on that unlucky day. I do not think, however, that a more than usual amount of mishaps fell to my share during the trip, and in travelling through the Nor' West one must be prepared to rough it in the extreme sense of the word, leaving one's squeamishness and fastidiousness in the matter of foods and household comforts of every kind safely stowed away in one's Perth hotel.

When I first mooted the idea of a journey through the bush in order to observe the country, and see for myself the capabilities—pastoral, agronomical, and mineral—of West Australia, that portion of the Nor' West which I selected for my first trip was painted in anything but attractive colouring. I would be harrassed by flies—sand flies and house flies, big ants and little ants, and all sorts of horrid creeping insects—by day, and at night my peaceful slumbers would be prevented by various species of mosquito, the "Scot's Grey" amongst them, with a trunk of the capacity of an elephant and a bloodthirstiness incomparable—the names of the other species of mosquito are only spoken aloud under the shadow of the bullock dray. Fresh water tea would be unobtainable; baths *quite* out of the question in the inland country. Centipedes, with a curious predilection for playing hide and seek in the toes of one's shoes, were quite common occurrences; myriads of flying grasshoppers cannoned against your face as you drove through them, leaving stinging blotches from the force of the impact. Even in the winter the thermometer registered something like 120 deg. during the day; the renovation of one's wardrobe would be confined to Turkey twill and hobnailed boots. Yet, notwithstanding all these and numerous other doleful forebodings, Friday, the 2nd of March, 1900, saw me on board the s.s. "Sultan" bound for Cossack. The "Sultan" is one of the steadiest boats on the coast, and Captain Pitts, her master, in spite of his gay *insouciance*, a most careful mariner. After a very pleasant voyage of eight days, having called at the various townships—Geraldton, Carnarvon, and Onslow—*en route*, experiencing at the last named place the tail end of a "willy-willy," we arrived in Cossack Roads on the morning of the 10th of March, and were transferred to the "Beagle," the Company's lighter, which brought us alongside the wharf at the turn of the tide.

The lighter had no gangway, and a deal ladder was requisitioned, by which we were to climb up to the wharf, the tide being only just on the turn and the water still low. It was a very slight rickety ladder,

and even my poor weight made it bend somewhat, but when one of our heavy passengers got on it, as soon as he reached the middle rung, the ladder described a perfect "U" with a fat body in the middle, and the face of that poor passenger, who expected the inevitable, was very pitiable. However, willing hands raised him quickly from his perilous position, and he was hoisted on shore, much to his relief. Our "impedimenta" was brought ashore in the same fashion.

Cossack, from the sea, presents a most hopeless appearance. A ruinous tumble-down lot of buildings, with heavy chains thrown over the roofs and fastened to the ground, front the landing place; this is to prevent them from being blown away by the "willy-willy's," which are such frequent and destructive visitors here. To my mind a good strong "willy-willy" that would make a clean sweep of all the rubbishy buildings that first meet one's eyes would be a very good thing for the place, and would do much towards lessening the dreary outlook that meets one on approaching by sea to Cossack. The township itself is niched between low sandy hills, absolutely treeless, if one excepts the sombre green of the mangrove shrubs. It was at one time the centre of the pearling industry, and from the grounds in its neighbourhood some of the finest pearls have been taken. On the centre of Jarman Island, in Cossack Roads, an iron lighthouse is erected, 51 feet high from base to vane; the centre of the lantern is nearly 100 feet above high water, and is visible all round the horizon for a distance, in clear weather, of 15 miles. A one horse tram runs twice daily between Cossack and Roeburne, distant nine miles inland; the seats are Irish jaunting car fashion, and have first and second class compartments, the second being in all respects similar to the first, only a thin wooden partition dividing the two; ragged curtains are supposed to shelter the passengers from wind and rain. The horses are worn out brumbies, and quite eligible for Zoological purposes; they travel half the distance, and a "fresh" animal, even more skinny and decrepit, jogs you into Roeburne, the journey lasting a little over two hours. The tram line traverses the country between some low hills. We saw a few turkeys on the way, some small skylarks, and a few lizards, these with a few brumbies, evidently worn out tram horses, were all the living things we met with on the road to Roeburne.

The town itself, nestling against the sides of Mount Welcome, looks rather pretty with its glistening white roofs against the dull brown background of the hills. Here, too, as in Cossack, most of the houses are bolted and chained, and at first sight there is something peculiar noticeable in the buildings that makes them appear rather odd, until you discover that it is a town without chimneys; no fires being needed all the year round, no one possesses a fireplace; the cooking is done in a little detached kitchen whose chimney doesn't rise above the low roof. The Harding river runs through the town, but, except in pools and deep places, it is generally dry in the summer months; a fringe of timber lines its banks. There is a church, a school, and a Mechanics' Institute (which possesses

a very good library), three very good hotels, and sundry other official and private buildings, as well as a prison. The inhabitants number about 180. Before the Port Hedland jetty was built Roeburne was the starting point for the Pilbarra and Marble Bar goldfields, but the convenience of Port Hedland as a port of call, and the construction of a causeway across the marsh, has taken much of the traffic from Roeburne. The surrounding country is, however, so rich in minerals that the diversion of the Marble Bar traffic to Port Hedland is not so much felt. It is, in fact, a typical mineral country, for, besides gold, rich lodes of silver, copper, lead, tin, antimony, and iron have been found, and in the marsh to the west of Roeburne rich alluvial deposits that required little working have shown that the country around Roebourne is well worthy of development.

Mr. A. E. Morgans, a well-known mining expert, visited that district during my stay in the neighbourhood, and was very enthusiastic over the auriferous aspect of the country which he passed through on his way from Roeburne to Pilbarra and Marble Bar. Since his return I have heard that he has invested a large amount of capital in the various mines up there. The Carlow Castle copper mine is but six miles from Roeburne, and has turned out some very good ore; the Whim Creek copper mine is also within easy distance, and Mr. Tozer's mine at the Nicol, Mr. Hardie's Towranna mine, Messrs. Hood and Brand's Hongkong mine, and the Balla Balla copper mines are the names of some others of the mines now in working order in and about the district.

The story of the discovery of the first specimen of gold-bearing stone near Roebourne may not be familiar to all your readers, and will, I think, bear repetition. The eldest son of Mr. Withnell, one of the pioneers of the Nor' West, picked up a stone one day on his father's run intending to throw it at a crow that had alighted near him. On looking at the stone he saw that it held traces of gold, and showed it to his father, who at once went into Roebourne and exhibited the specimen to the then R.M., Colonel Angelo. That gentleman became so excited with the news that he rushed to the telegraph office and despatched a wire to the then Minister for Mines communicating the news of the find. In his excitement he merely telegraphed: "Jimmy Withnell picked up stone to throw at a crow." The Minister's reply was a query, "And what happened to the crow?" However the gold was there, and several mines are now in good working order. So much for the mineral aspect. The country inland from Roebourne is very sparsely timbered, eucalyptus, ti-tree, cork tree, and curly bark being the chief ones noticed, none of them, however, growing to any great height. They are principally to be found on the river banks or along watercourses, but there is really very little timber country between Port Hedland and the Fortescue, on the banks of which I came upon the first big timber.

Several species of native grasses are to be met with in the district round Roebourne, and a good many obnoxious ones amongst

them. Of the latter I may mention corkscrew grass, spear grass, and spinifex. It has been asserted that the native grasses are not good forage plants, but our horses took us from Roebourne to Port Hedland, and thence to Carnarvon, with no other feed than the native grass, and at the end of our journey they looked even more fit then when we set out.

The native hay is a great boon to the station owners during the summer and the dry season.

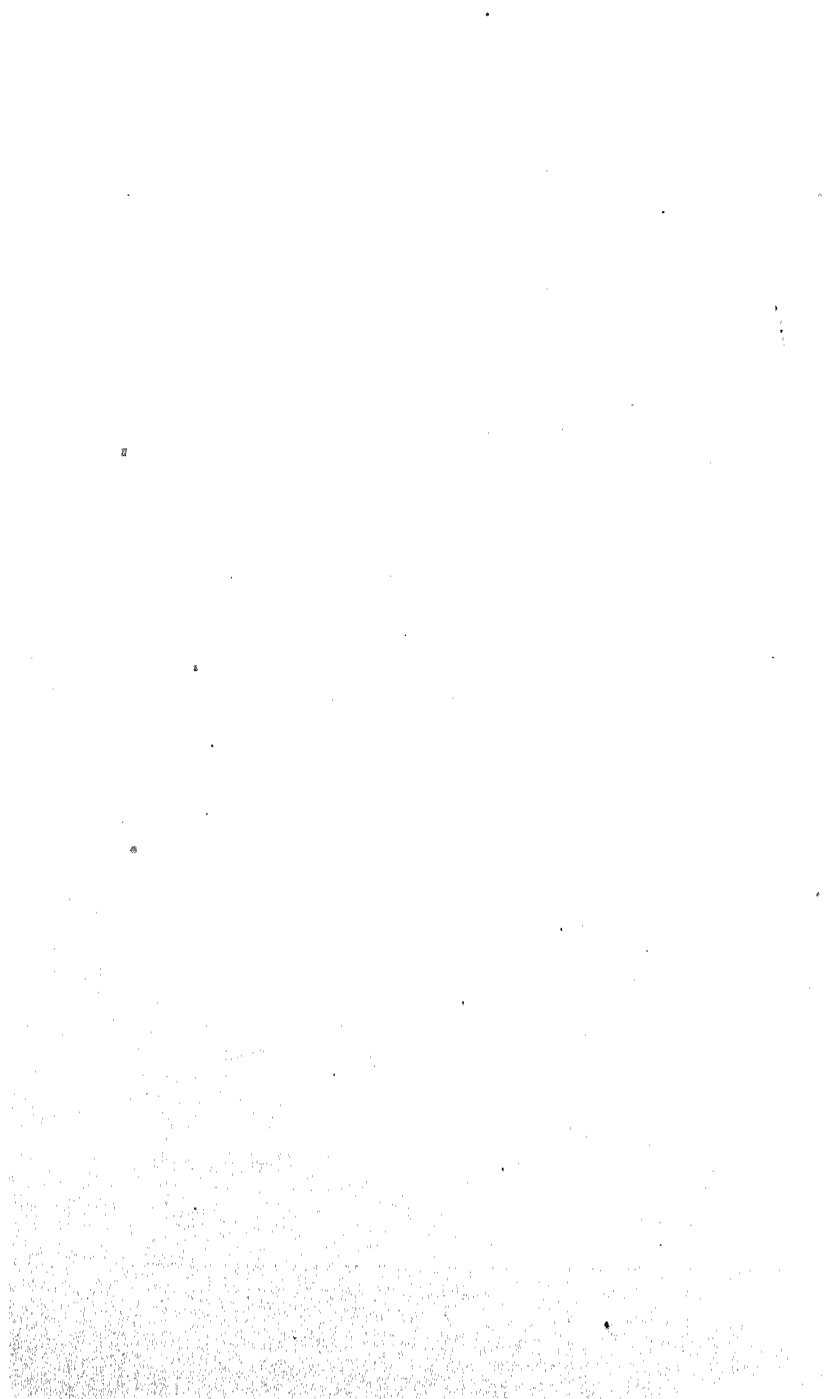
Kangaroo, turkey, duck, pigeon, and teal are to be met with within a short distance of the town, and afford some good "Sunday" sport to the inhabitants. In the whole of the district lying between Roebourne and Port Hedland I saw only three snakes, and very few lizards, but I have been told of a rock python that eats kangaroos, and is to be found some distance from the town. There were not many bird voices either, a few small parrots, and numerous speckled doves—a very pretty bird—and many varieties of the Java sparrow were the principal. Some beautiful beetles are to be found in this district. The "W" beetle is a lovely pale green insect with a clearly marked "W" on its back; upside down it forms an "M," and as "W" stands for Westralia and "M" for "Muyra," the native name of this part of the country; it makes the insect very interesting. Large yellow and black beetles, and a beautiful green and gold variety called the Du Boulay beetle are to be found here, also the elephant beetle, the borer, and many others. I caught a borer and placed it in a small thick cardboard box, and during the night I heard a most extraordinary gnawing noise, as though a rat was trying to eat its way through the wood; it was not until I had lighted a candle and located the animal that I found the noise proceeded from my captive borer, who was energetically tunnelling his way through the box, and had already, in a few hours, almost filled it with tiny shavings. Moths and butterflies were also to be found of the most beautiful and varied colours imaginable, all shades of blue, mauve, gray, green, etc., these colours being represented in the tiniest of the moths.

The natives in Roebourne number about 200, some of them very fine looking men; the women are very inferior looking. They make several articles from the spinifex grass, which grows so abundantly about here. Netted bags, which they manipulate with a small kangaroo bone, beads, rope, and a splendid glue, which they use to fasten their glass spear heads on the end of the wooden spears. This spinifex, though very spiky, makes excellent bedding when camping out.

The natives, in cases of sickness, take a sharp-pointed wooden carved flat stick, one point of which they stick into their stomachs and leave it there to fester; I believe they generally recover under this treatment. I do not know if it is only used in special cases of illness, or whether it is used in all cases. They have no Deity, but many devils, and to frighten the evil spirits they have a long carved stick with a hole in one rounded end through which a string made of human hair is passed, and they twirl this round and round,



PLAN SHOWING ROUTE TAKEN.



making a booming and most depressing noise sufficient to send any poor devil flying from the sound of it. There are about 20 kinds of food plants which they use, amongst them the "beach bean" and the Australian millet, the seeds of which they collect in large quantities, grind them between stones, and bake them. They have also various methods of burying their dead—on trees, in a hollow log, or doubled up underground. They have, too, a very curious instrument which I could not find the use of. It is a rod about nine or ten feet in length, and towards the top they place crosswise two carved flat sticks about a foot apart, and from the points of these they make a kind of hexagon of human hair.

Leaving Roebourne we cross the Harding River, Payne's Creek, Jones' Creek, Eastern Harding, and George rivers, all, I believe, on the Woodbrook run, a sheep station owned by Messrs. Church and Co. Passing Mount Fisher, a sheep station named after the owner, we reach the Sherlock station, one of the most hospitable places in the whole of the Nor' West, and owned by Mr. J. G. Meares, whose kindly and generous nature has endeared him to all those with whom he has come into contact. The station is some 30 miles from Roebourne. It has been visited very often by the willy-willy, which wrecked the homestead twice and killed thousands of sheep; the house has now been built above the highest known water-mark, and up to the present has weathered these destructive storms.

The peculiarity of the country is very striking; the description of that round Roebourne applies here as regards the pastoral aspect and the species of game, but those curious mounds or "kopjes" are very puzzling. Great huge boulders rise up from the flat as though they had all hurried to get out of the way of something that was threatening them from below; they rise to almost a uniform height, about 20 or 30 feet; if you climb any of them all the others seem to form a circle, in the centre of which is the mound upon which you stand. There is a slight difference in the formation of some of these boulders, granite, and sandstone and other kinds of stone may be found together in one of those "heaps"; brown, gray, blue, they vary in colour and size, but the surface of most of them is smooth or waterworn. They somewhat resemble the stones in what is known as the "ploughed field" on the summit of Mount Wellington, Tasmania. On the flats you come across the jagged ends of quartz reefs rising out of the ground. It is not to the interests of the squatters that gold should be found near their runs, for the depredations of the curious conglomerate that forms the first rush to a goldfield amongst the station stock could not be very easily checked, the runs here being scores of miles in extent, and so the reefs are left undisturbed.

A fine river, the Sherlock, from which the station takes its name, runs through the property, its banks being rather well timbered. All the country from here to Port Hedland seems to be looked upon as good sheep country only, but the few cattle and horses we saw on the various runs gave evidence of the country

being equally suitable for the larger kinds of stock. The gardens can only be cultivated in the winter months, but during that period it is astonishing to see what can be done in the way of raising vegetables. The destructiveness of the willy-willy in some parts can be judged from the fact that at Boodarie station the garden has been four times completely washed away by the floods that followed these monsoons, and the task of forming a new garden with fresh earth which had to be carted some distance was extremely hard. However, people must have vegetables, and these troubles are usually patiently met and as patiently overcome.

We crossed the Sherlock on our way to Balla Balla, a small township that just "hangs on" to existence, as it were, on the strength of a few mines some distance inland. A jetty has been erected at this little port, which is well sheltered by Depuch Island, which lies immediately in front of it, about three miles from the shore. Balla Balla is about twenty-five miles distant from the Sherlock station, and consists of two hotels, a post office, and a blacksmith's shop. A willy-willy visited the place about two years ago and completely levelled the post office, scattering the fragments over a distance of five miles. A new building has since been erected. The road to Balla Balla takes the shape of a horseshoe as you come to within three miles of the township, and instead of taking a bee-line across the flats, you have to drive nine miles round. "Why?" I asked. "Because we must follow the tracks," was the reply. I suppose the first teamster went there in flood time, and had to make a detour in order to avoid the swampy ground, and ever since then other bushmen have followed his tracks, and have never thought of striking out a new road across country. The bushman proper is one of the grooviest persons in the world.

Some curious atmospheric conditions prevail at Balla Balla, and mirages are frequently observed. On our way there we discerned a number of lakes, in the midst of which were numerous islands, but as we approached these faded, and the dull, dead reality of a dreary, cheerless plain greeted us. After we left the place, and had gone some distance, I looked back, and beheld Balla Balla floating as it were in a soft, calm sea. I could actually see the reflection of the houses in the supposed water.

Balla Balla Creek runs a little distance from the township. The herbage about here is rather poor and scanty, and spinifex abounds. Three miles from Balla Balla is Whim Creek, the waters of which, like a great many of the Nor' West rivers and creeks, are salt or brackish, and from the quantity of salt in the soil rain pools in a very short time become almost undrinkable. Very heavy dews fall in these localities.

The country between Balla Balla and Mundabullangana is of a better quality as regards herbage than that lying between the Sherlock and the township. Mitchell, oat, and kangaroo are the principal grasses, with a good sprinkling of spinifex. Nine miles from Balla Balla we come to Peawah Hill, another rubbly "kopje"

on the route; the stones here are much smaller, and give clearer evidence of volcanic origin than those round Roebourne and the Sherlock. Being in places but five miles from the sea, we see many varieties of seabirds, gulls, shags, ibis, cranes, etc., while inland we find numerous turkeys, ducks, Australian skylarks, pigeons, etc.; there is a kind of night-jar that I have heard singing the whole night through. I have never seen this bird that I know of. Other birds with bright, clear, sharp notes, numerous species of the finch family, with most attractive plumage, fly about through the scrub, and correllas, Java sparrows and minahs are also to be found here. Before we reached Mundabullangana a thunderstorm broke over us, and a short distance away the *green* spinifex was struck by lightning and set alight. The country round this station is very cheerless; the wide treeless plain stretches out before you unrelieved by a single point of beauty; no song birds trill their tuneful notes; and there is a lifelessness and consequent "eeriness" in the landscape, which is added to by the great grotesque brown mounds of the white ant, that crouch ghoul-like over the vast bare flat. The Island of Depuch, many miles away, looms blue and dim in the distance, but its unlovely outline only intensifies the dreary treeless waste between. When rain falls here it turns salt almost immediately, most of the soil being a salt sand. I saw some pools that remained from the thunderstorm before mentioned, and already round the edges of the pool were the white encrustations observable in salt marshes; the waters of the pool too were brackish. A beautiful mauve wild convolvulus, and a large yellow flower with a rich brown centre, and somewhat resembling the hibiscus, grows round here; also a curious four-leaved flower, small and yellow, and a very small blue flower like the nemophile in appearance.

Left Mundabullangana for the Six-mile River, crossing the Yule, which had risen during the night, at another point further north. Except in the case of the larger rivers, such as the Yule, the Fortescue, etc., most of the smaller rivers, creeks and tributaries are named collectively "six-mile," "nine-mile," and so on, though where the mileage is reckoned from I have only in a few cases been able to discover. In most of these cases it is oftener nearer nine miles than six from the place we started to the "Six-mile." There are large patches of very good pasturage on this run, which is, I believe, the largest run in the Nor' West, something like 3,000,000 acres being held by the owners. I do not yet understand the intricacies of the Land Regulations of this State in their relation to squatting leases, or whether there is any limit as to mileage in the selection of runs for pastoral purposes. I shall be glad to receive accurate information on this subject. [The Under Secretary for Lands will, I am sure, be only too glad to explain to our contributor, or anyone else, the alleged "intricacies" of one of the most attractive Land Acts in the world.—Ed. JOURNAL.] Most of the land on the run above mentioned is very good both for sheep and cattle. A good deal of it is salt bush—an excellent forage plant for

stock. It is also a well watered district, from the Yule and its branches and tributaries and various creeks. All over this part of the country, too, auriferous indications are to be found, but nothing has been done in the way of experimenting in likely places. Crossed Turner Creek and tributaries *ad lib.* in the twenty-five miles that lay between Mundabullangana and Boodarie stations, and passed over some fine country, well grassed and moderately timbered, and, from the nature of the soil, not quite so dependent on the rainfall. Droughts have rarely been felt, though floods have at times occasioned great loss among the stock. This would make a good cattle run, from the abundance of coarser herbage, tall oat grass, Landsborough, and many other kinds of good pasture grass, which grow to a height of two and three feet. Several species of salt bush grow abundantly here. These plants are most tenacious of life, in fact the drier the season the more luxurious many of them grow. Moreover it is noticed by pastoralists that where plenty of these salinous plants are growing amongst the natural grasses, diseases among sheep or horses are comparatively unknown.

Boodarie is well favoured with regard to its position. It is but twenty miles distant from Port Hedland, the land is exceptionally good, a navigable creek runs up to within six miles of the homestead from whence the wool is transhipped to the coastal steamers, and the water in the various wells is of a much better quality than is to be found in the district between Port Hedland and Roebourne. It is not so frequently visited by the willy-willy either, as those districts mentioned, but when its turn does arrive considerable damage is done. I mentioned in another place that the Boodarie garden, soil, fences, gardener's hut, and everything there were swept clean away four times during four successive monsoons.

Leaving Boodarie, we travel to the "nine-mile," which, in this instance I am told is nine miles from the station. The country is flat and scrubby, we saw no birds nor game of any kind, though I believe turkey and kangaroo are plentiful.

Seven miles from Port Hedland we come to the Causeway, and from thence have a jolting, rocky ride of three miles or so.

This Causeway has been built over the marshes for the conveyance of supplies from Port Hedland to Pillbarra and Marble Bar, some 80 miles distant from the Port. The building of the jetty, alongside which the biggest coastal steamers can be moored in safety, has proved a great boon to the dwellers on those fields; it has lessened the distance from the coast to the fields by about fifty miles. Formerly the teams went *via* Roebourne, but the opening up of Port Hedland and its suitability as a shipping port has diverted the chief traffic from Roebourne, and now practically all goods, machinery, etc., are landed direct from the ship to the jetty, thus saving lighterage, for it is rarely that the steamers cannot come right up to the jetty to discharge passengers and cargo. Two hotels, one store, a post office, a blacksmith's shop, and one or two private dwellings are all the buildings the township contains. It is built on a sandy flat, with stunted mangroves fringing the shore

(the only timber to be found there), and the little vegetation there is poor and rank, the water is brackish and unpleasant to the taste. The hotels and stores are principally built of corrugated iron, all the timber having to be imported. Coaches run twice weekly to and from the goldfields and also from Roebourne, and it is a port of call for all the mail steamers trading between Fremantle and Singapore. Port Hedland has only been in existence about three years, but in that time it has made considerable progress and bids fair to become one of the leading ports of the Nor' West, and the facility with which stock can be shipped from the jetty to the mail steamers is greatly appreciated by the pastoralists of the surrounding districts. 1,500 sheep can be shipped in a very short time, the jetty arrangements being very good for the transhipment of stock.

Unfortunately the absence of competition in the mail service is a great drawback to their efficiency as to stock and passenger comforts; passengers have to take what they can get in the matter of food, etc., and some steamers are not seldom given to overcrowding their decks with stock, to the discomfort of the passengers, and to the endangerment of the stock from overcrowding. All this will doubtless be remedied in time; in the meantime one has to make the best of a very poor coastal service.

Fish abounds in all the inlets along the Nor' West coast, and are very easily caught with crab bait, or in nets. Kingfish, jewfish, bream, taylor, whiting, garfish, skipjack, and many others are to be found in the Port Hedland waters. Turtles are numerous, and of the crustaceous variety. There are crabs, crayfish, and rock oysters. I saw a dugong, an amphibious mammal, similar, I believe, to the manatee, of Mexico, close to the shore one morning. I believe its flesh is good for food, and its skin is valued for making leather. The manner of catching the turtle is to row up quietly beside them, catch hold of their hind flippers, and turn them over, if possible. The native method is to row up close to the animal, and then drop gently from the side of the boat, catch hold of the flippers, or hold the turtle's head above the water, thus making the creature helpless; then, if it is a large turtle, they make it "turn turtle," and tow it along. It is very pleasant sailing round the estuary, and visiting the many islands scattered over it. On some of these islands the pearling boats used to "lie up" during their idle months, and wells have been sunk on some of them, having good water. One or two graves can be seen also. None of the islands are of any great extent, and there are no trees on them and very rank herbage.

I have heard of some rock carvings that were to be seen, which had been done by the natives. I found, on inspection, a rude attempt at a kylie, a turtle, a faint likeness to a shark, a bird, and sundry other nondescript indents, but the little belt upon which the carvings were is now the main road to the causeway, and the tracings are being rapidly obliterated. There was a meat famine at Port Hedland on the day of our arrival, but in the evening a

letter came from the proprietor of the opposite hotel, which read:—"dere boab I af gil a big, I sen yu aff. B.T." The present was gratefully accepted, and we had pork morning, noon and night while the "aff" lasted.

There are no police at Port Hedland, but law and order are maintained efficiently by the inhabitants, and only in extreme cases is it necessary to wire to Roebourne or Marble Bar, 130 and 80 miles respectively, for a "guardian of the peace." One day I witnessed a rare sight—a mock sun—shining and sending forth rays irrespective of the real sun, which was in another part of the horizon.

Some distance out from Port Hedland—at Pepingarra—there is some good pastoral country, which is, I believe, stocked from Boodarie, but beyond its being one of the best natural harbours in the Nor' West, Port Hedland at the present time has not much to recommend it. It will not be in my life-time that the mineral resources of the country round here will be fully developed and carry a thriving population. At present the white population numbers about forty.

Of the manner of native burials here, I have heard the following account of the burial of a De Grey woman, witnessed by the man from whom I got the story:—Bark was placed round the body, and a very shallow, oval grave was then dug, and the body put into the cavity, and immediately as many jumped on the body as the grave would hold, and set up a most unmerciful howling in chorus; meanwhile those of the women who couldn't get in threw sand into the grave from tiny cockle shells. The mourners on the grave had to be dragged away, and afterwards the grave was covered. In the case of a child dying, the mother takes the elbow bone of the deceased, and carries it about with her for a long time. The return of the "prodigal son" is also rather interesting. Suppose a black-fellow goes away for some time, either droving or with another tribe. When he returns his mother goes to him, folds him in her arms, and howls loudly over him. Then she gets a good sharp conch, and proceeds to cut herself with it, all the while howling for all she's worth. When much blood issues from the cut she subsides, and her place is taken by a male relative, who forthwith cuts himself with a jagged tomahawk, drawing much blood, and so on, till they all have an innings in the auto-bloodletting business, when the rejoicings at the return of the prodigal son are over. A Government official told me to-day of his having seen a native woman gather the roots of a certain tree, pound them into a kind of flour, open a vein in her arm, letting the blood fall on the flour, mix, bake, and eat it.

March, April, and May are the rainy months in these parts. No attempt at gardening has been made, and tinned vegetables of all kinds are used; tinned milk too (for nobody seemed to own a cow), tinned meats, tinned everything. It is along this coast that the Beagle Bay vegetables and fruit should find a market. The missionaries have recently purchased a schooner, but I have not

yet ascertained if it is their intention to bring their produce down the coast for sale. It would certainly be a boon to the people in the coastal towns. Sometimes, but very seldom, the Singapore boats bring over some fruit and vegetables, the potatoes particularly being of a very inferior kind, but if a market could be opened up with Beagle Bay it would be an excellent thing for the missionaries and the dwellers along the coast, there being no comparison between the vegetables and fruits grown at Beagle Bay and those imported from Singapore.

We took the same route on our journey back to Roebourne, from whence we were to make a start for Carnarvon.

We left Roebourne on Friday, June 15th, Karratha Station, 36 miles inland, being our first stopping place. We passed "Weryanna" and some other mines on our way. The chief feature about this region is its utter dissimilarity to any other known part of the world. In the sandy deserts of Arabia water is unknown, and no vegetation exists; here the sand ridges are clothed with many varieties of shrubs, and with the smaller species of acacia and eucalyptus; this detracts in a small measure from the dismal appearance that bare sand ridges would present. But the shrubs supply no edible food, neither do they give any indication of water; they just "clothe the nakedness" of the barren region in which they grow, and make it a wilderness instead of a desert almost divested of animal life, and painfully monotonous.

The best pastoral land, consisting of large low alluvial plains interrupted at intervals by rocky hills, lies between Port Hedland and Carnarvon. I believe the same belt of pastoral country runs up to the De Grey River. A high tableland runs south and east from about 60 miles beyond Roebourne. My journey was undertaken in the winter after the rains had fallen, and consequently I saw the country at its best, and it certainly looked most green and flourishing, the tall grass waving in the balmy air and reaching to our horses' knees, miles and miles of it, as far as the eye could reach.

Mitchell, tall oat grass, kangaroo grass, and Australian millet were all represented, a few shrubs, some quartz outcroppings and the usual jumble of rocks were the only variations in the long stretch of waving green before us; these, however, never rise much above the level of the plain. A short distance from Karratha we cross the Maitland River, and at noon we arrived at the Yannaree River, which we proceeded to negotiate by the usual method of following the buggy tracks into the water. We had not gone far in when we found the horses swimming, our luggage completely under water, and ourselves wet to the waist! We struggled out, and drove on a further distance of seven miles to a place called Devil's Pool, where we camped amongst the spinifex. I will draw a veil over the result of my investigation of the damage done to my luggage. Ten miles from Devil's Pool there is a Government well. Mobs of kangaroos were scattered over the plain, revelling in the bounteous pasture. There is a native woman

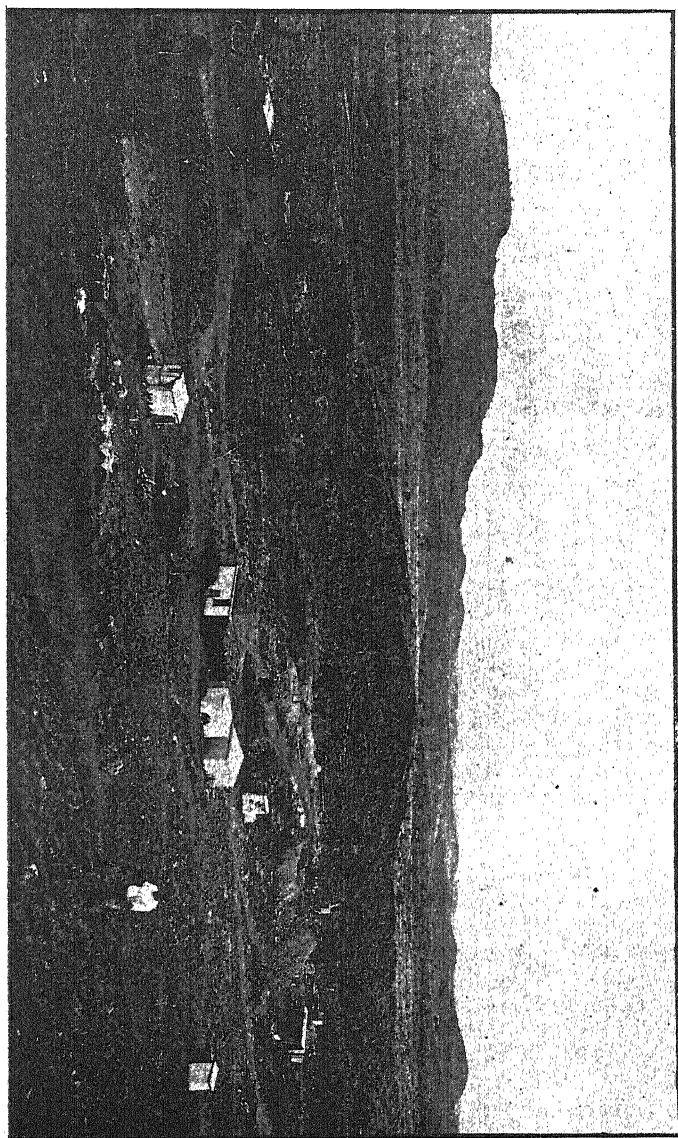
at Karratha who has a very keen sense of humor and is a capital actress. The details of "Yamba de Rougemont's" life had been related to her, and she was so seized with their humor that she would lie down and feebly ejaculate, "Good-bye, my husband; I am going where you will follow," and immediately afterwards she would jump up and begin dancing round to show how juvenile she was. Who can say after this that the natives cannot appreciate humor? We camp at Irremurra Creek, and next day we cross the Fortescue River, the first large river that we have come to, and where I saw the first big timber during our journey. The Fortescue in the winter is a very fine river, so clear that you can see to a depth of 30 feet or more. It rises in the granite ranges of the interior, and runs through flats bounded by rough sandstone hills. The Hammersley Ranges run beside the Fortescue for some distance.

Small peaks of quartz, granite, and ironstone, with soft calcareous slates, rise to the surface in the country between Irremurra and the Fortescue; a splendid grazing country too, and with valuable mineral deposits. Indeed it is impossible to exaggerate the magnificent outlook on the vast tracts of auriferous and pastoral territory we passed through. Distance, and the scarcity of timber are the only drawbacks to the development of the mineral resources of the Nor' West.

A species of spinach, called locally "fat hen," grows abundantly on the flats, and is used as a vegetable. A telegraph station is set down in the midst of this wild bush for the convenience of the few pastoralists in the vicinity.

Mardie Station is on the Fortescue, and is well grassed and watered; the sea comes up to within a few miles of the homestead, and I should think the marsh lands would be very valuable in the dry season from the abundance of salt bush growing there. There is a very dismal view of the great flat plain from the verandah of the homestead, but Nor' West pastoralists were not so keen on fixing upon beauty spots for their houses; centrality and utility were the points most desired. Chirringarra, now an out-station belonging to Mardie, is 17 miles from that station. There are the most curiously twisted gnarled gum trees, with bare white tortuous branches, growing on the banks of Chirringarra Creek, the trunks and branches quite shiny and naked looking. The gouty-stemmed tree is remarkable for the swelling of its *trunk*, which gives it a clumsy deformed appearance; it produces a fruit containing seeds which are used by the natives as food. Beyond the trees that fringe the creeks and rivers of the Nor' West very little timber is to be met with in the vast plains over which we pass, and it is sometimes difficult to collect sufficient food for the fire and for our tent pegs—that is the larger ones. Snake wood is almost too crooked to burn, but it makes a very bright fire, and is the only wood to be found during many miles of travel.

Yarraloola Station, 13 miles from Chirringarra, and an auxiliary of Mardie Station, possesses a really fine vegetable garden, but



VIEW OF THE COUNTRY BEYOND KOEPOUNE.

there is plenty of water from the Robe River, which runs just below the house, and wells have been sunk on this run. The whole drive of 30 miles from Mardie to this station was over a plain, unrelieved by even the tiniest hillock; a miserable cork tree here and there comprised, with a few gum trees, all the foliage we met with on the way.

A large eagle-hawk had been captured at Yarraloola some time ago, and is now quite tame. Parrots, cockatoos, magpies, finches, and one or two other varieties of birds flew about here. The land is very good if it is unlovely, well grassed, and with some good saltbush patches.

Challion pool, twenty miles from Yarraloola, is a permanent one, and has never been known to run dry. It is of very great depth. Challion Creek runs into the Robe River. I saw the giant kingfisher here—the first I have seen in the Nor' West—correllas, green parroquets, minahs, and numerous finches and other small birds frequent this place; also turkeys, kangaroo, and emus. Of the latter I only saw the tracks, and in the whole of the journey I never saw one emu, so I cannot think they are very plentiful, unless very far inland. We then came into the "kopje" country again, but most of the hills are table-topped, only a few peaks scattered here and there amongst them. The only timber is that fringing the banks of the Robe; the Sturt pea grows hereabouts, and some delicate shrub plants of a pale yellow, and a majenta flower rather like the heliotrope in form. A curious grey plant covers the plains; it is not unlike a small lamp-brush in shape. Looking at it *en masse* it bears a curious resemblance to a crowd of people. Red Hill Station, near which is the Red Hill copper mine, is about 12 miles or so from Challion pool. I saw, at the station garden, a pumpkin growing that was almost a yard and a half in circumference, the biggest one I have seen outside Gippsland; it speaks much for the fertility and richness of the soil. The same belt of good country still continues, and there is some good timber on the banks of the creeks and watercourses. Thirteen miles from Red Hill there is another Government well.

Mount Stewart is about 26 miles from Red Hill, and looks like gold-bearing reef. Close to it is the Red Hill copper mine, the outcrop glittering in the sunshine. The Caen River, near it, held about two cups of water; Mount Amy looked dim and blue in the distance. We saw several species of duck—white wing, black, wood, and whistling ducks—and some teal.

We came to another big river, the Ashburton, a swift and dangerous-looking stream where we first struck it; it is partly in flood from recent rains. Myriads of white cockatoos fly hither and and thither over it, alighting for a few moments, and then, with a sudden and simultaneous "frou-frou" of wings—the sound of which reminds me of a women's meeting, just at the moment when all are asked to rise—they take wing again with loud intermittent shrieks. The Ashburton, like the Fortescue, rises in the granite ranges of the interior. Just where we camped it had made a very deep bed

in the soft clay, and being in flood, large masses of clay were being carried away by the flood waters. The banks are finely timbered, and the pasture splendid; nevertheless the country is unmistakably auriferous, and all through from here to the Gascoyne there is a belt of gold-bearing country. Outcrops are visible everywhere, and the Ashburton goldfields have yielded a goodly share of the precious metal since their opening. Granite and sandstone hills of the usual size are dotted over the plain. Mount Alexander and Mount Murray to right and left of us show that we are coming to slightly different country; small valleys, surrounded by hills of rather more dimensions than those we have hitherto passed, seemed to open into each other, and until you had "turned the corner" of the one you could see nothing of the next one. We drove parallel with the Ashburton until we found a suitable crossing, which we did a little below Nanutarra station. The second mishap befel me here, for in making some bon-fires I accidentally fed the flames with my only remaining coat!

The country opens out after we leave the station, and again the wide plain stretches before us, though, owing to the formation of the "road," we seem to describe the letter "N" for the first few miles, with Mount Alexander as the angle.

From Nanutarra to Uaroo station is a distance of twenty miles through very fine country, slightly picturesque owing to the broken nature of the ground. The hills surround the homestead, and some very pretty "Yilgai" trees have been planted, and afford good shade and pleasant coolness. Cadjeput and black heart grow here too, but in very small patches.

Our road from Uaroo wound through the hills, and in the distance small clouds of dust rising in the valleys told us some dryblowers were at work. We came upon a "hatter" camped beside a clay-pan, who told us they were all doing "fairly well." It would be very easy to get lost winding in and out among those hills; we once retraced our steps for some distance, and only discovered our error when we came upon some special landmark we had previously noticed when we passed that way. There are a number of waterholes about here, but those are from the recent rains, as this is a dry stretch of country until we come to the Lyndon, which we cross about a mile from Yanyearreddy station. Williambury Station is also on the Lyndon, and close to the homestead there is a permanent pool, a great boon in the long spells of dry weather. A splendid vegetable garden is cultivated at Williambury, and, as there is never any lack of water and the soil is most fertile, there is no difficulty in growing various vegetables all the year round. Five miles from the station, and beside a well with an automatic windmill, there is a big crystal quartz outcrop glittering like opal in the morning sun. I must mention that at Yanyearreddy I saw the first fireplace and chimney since I left Perth, concluding therefrom that we had entered the "fireplace zone." I heard a very pretty bird in the bush near Williambury; it had four notes, almost like half a scale, which it poured forth in a clear soft voice.

I think the worst piece of road we have travelled lies between Williambury and Mydallya, a distance of 20 miles, over a wide treeless plain. The Minilya River was almost dried up, only a pool here and there, the river bed being covered with well-rounded cobblestones. Several varieties of salt bush grow in this district—the “old man” salt bush, the bladder, the half-berried, and the kidney-fruited are amongst them. Mulga, gidya (jam wood), wattle, and sandal wood are the only timber, except the line of gums along the river bank. For exportation the sandal wood is cut in curly faggots; the timber is gnarled and yellow, inclining to an orange red. When it is cut the fragrant essential oil it contains gives it a very pungent odour, but that goes away as soon as the timber dies. A thick coarse grass, prickly and seedy, intermingles with the salt bush on the plains; game is moderately plentiful along this route. Just now, with water filling the river beds, abundance of pasturage, and the daily sight of the stock fattening visibly on the bounteous feed, the pastoralist, as he drives or rides through his extensive run, feels buoyant and hopeful of future years, and the droughts of the past quickly fade from his mind as he complacently surveys the “things that are.”

There is very little diversity of landscape in almost all the country through which we have travelled. I climb every available hill, but the same scene presents itself, vast and almost treeless plains, encircled by the same old rocky hills, are all that meets the view. A clump of trees, a sheet of water, a glimpse of blue hills in the distance, how much these would detract from the depressing monotony; but the reality is the vast plain with its environment of faded looking grey hills that no distance could lend enchantment to, the sunrise giving no touch of beauty to their stern stunted heights, and the soft and gentle rays of the setting sun beaming upon them without changing for a moment their sombre forbidding aspect. The curious shapes of the stunted gidya and sandal wood shrubs add to the melancholy of the scene. In the dim grey of early dawn these trees suggest monsters of an antediluvian age, their twisted gnarled branches transforming themselves into the horns of some huge creature, which, slowly waking from its heavy sleep, drags its loathsome length over the plain. The grotesque shapes those trees assume easily lend colour to the wildest flights of imagination, and it is not difficult for a mind imbued with stories of ancient history and mythology to people those prehistoric-looking plains with fitting denizens.

Wandagee Station is about 20 miles from Mydallya. It is watered by the Minilya and its tributaries; a large dam has been made to conserve the waters for the use of the stock in the summer months, and some good wells have been sunk. There is a great deal of salt bush land on this station, which is a very thriving one. Here our third mishap occurred, for the king bolt of the buggy snapped in two, and it had to be taken back some miles to the station to be repaired by the station blacksmith. It happened very

fortunately that we were not more than 12 miles from the station when the accident happened.

From Wandagee station until we reach the Gascoyne the only water is to be found in clay-pans, ti-tree swamps, and a few pools in dried watercourses, and one or two dams, or tanks as they are locally called. The water in the clay-pans and pools are invariably of the consistency of cocoa, requiring much ashes and charcoal to make it drinkable. We drove in these parts through miles of everlasting marguerites, and the fragrant purple pea flower, allied to the vetch family, which emitted a delightful perfume as our horses crushed it beneath their feet. From the top of one of the many low ridges that interspersed this plain, we saw Cape Cuvier. "Yankee's tank," a very good dam, has been built in a locality where it comes most useful to the traveller, and a nice *clean* water-hole some twelve miles further on seems to be the haunt of coot and numerous other wild fowl. For the first time in all our journey I heard the music of multitudinous small birds. They began to sing about 2 a.m., and kept it up until sunrise, and then the "singing glade" resolved itself into a clump of low thick scrub, and there was neither sight nor sound of a single bird! Another tank—Shaw's—was reached at mid-day, and then Boolathana station, a very fine property. A large waterhole not far from the house, and the presence of some very fine trees that former owners had planted, added an air of homeliness and comfort to the homestead. The surrounding country is very fertile, and carries a mixed pasture, grasses, salt bush, mulga scrub, and the purple pea plant before mentioned, the salt bush and mulga being good "stand-by" for the dry seasons.

A further drive of twenty miles and we reach the Gascoyne, which is about three miles from Carnarvon. We ploughed through seven miles of sandy country before we reached the river. The river *bed* is very wide, but only a small stream about seven feet in width was running on the Carnarvon side. The incline to the river is very slight, so that the Gascoyne in flood must cover an immense area of the surrounding country.

Up through here, and right on to the Ashburton, there is a belt of gold-bearing country, which, in many parts, is being developed, but the great distance of some of these goldfields from a port is their chief drawback. Food is very scarce and dear, and water is only plentiful in the rainy season. However, in the near future, when science is called in to aid in securing the feasibility of a good water and food supply, and a method has been discovered for the cheaper transit of goods, the splendid auriferous tracts of country through which I have just passed will become not the least amongst those great goldfields which are now so prolific a source of wealth to their respective States.

I am only voicing the opinion of practical men when I say that West Australia will eventually become the greatest gold-bearing country of any known part of the world.

TRANSCONTINENTAL RAILWAY.

RETURN OF THE SURVEY PARTY.

A DESCRIPTION OF THE COUNTRY.

Mr. John Muir, Inspector of Engineering Surveys, and the officers of his party were welcomed back to Perth on the 5th inst. In response to the toast of his health, Mr. Muir said that when they met on the last occasion, Mr. Wood, the then Minister, and Mr. O'Connor passed some very eulogistic remarks with reference to himself, and as to his capabilities of undertaking the work. At the time he felt that their kind expressions were hardly warranted, inasmuch as they were taking him on trust and praising him for work which had not been carried out. It was very gratifying to him to hear what had been said of him then. Now, however, after having performed the work, he had not so much reluctance in accepting the flattering utterances. He did not in any way claim to have carried out any extraordinary feat. They had certainly gone to Eucla and back, and obtained, as fully as possible, such information as would be required for the construction of this State's portion of the transcontinental railway. He did not take to himself all the credit. With the officers and men who accompanied him on the trip, and the equipment placed at his disposal by the Government, he could not possibly have failed. As they would remember, they left Kanowna in the middle of May last, intending to cross the lakes at that place in an easterly direction. He found, however, that it would be impossible to take the caravan across the lakes, and he decided to go northward *via* Kurnalpi. From Kurnalpi they went east for about 20 miles *via* Yindi Rock, and from there southward to Cardinia, this bringing them back into the country traversed by a direct line between Kalgoorlie and Eucla. From Cardinia they examined the country missed back towards Bulong, and afterwards went east, following generally the proposed route along a line of granite outcrops to Jummania. This was the last granite outcrop they could discover in the locality, and, consequently, they had to look for their water supply elsewhere. He decided, therefore, to make for Goddard's Creek, which place they reached about June 2, being five days out from Jummania without water. They discovered and opened out a native well in the bed of the creek, but, to their disappointment, could not obtain sufficient water to give the camels a drink. Next morning the party was split up into three prospecting parties, which either had to find water or retrace their steps. He went westward, Mr. Babington eastward, and Mr. Anketell northward. He was fortunate enough to discover four or five native soaks, which he considered sufficient to provide a temporary water supply. Mr. Babington discovered another good soak 12 miles to the east, but Mr. Anketell was unsuccessful in finding water. It was decided to shift the camp to where Mr.

Babington had found water, and then to proceed down the creek for some 30 or 40 miles, opening and exhausting numerous native wells as they went. The creek at this point lost itself in a limestone plain, and they were unable to obtain water from any other source, although they prospected some 60 miles northward and eastward. This necessitated their going back, making southward to Balladonia, or south-east to Eyre. He decided to adopt the last-mentioned course, and on June 25 Mr. Babington, with the main caravan, started for Eyre, whilst he (Mr. Muir), with one man and two riding camels, followed out the general direction of the proposed railway to a point about 60 miles north of Eyre. After a very trying trip of nine days, during which his camels had no water, he reached Eyre on July 3, and found that Mr. Babington and his party had arrived there on the previous night. At Eyre he found that the next water was at Mundrabilla, 100 miles along the coast line. He, therefore decided to send the main caravan on to that place, whilst he proceeded northward to about the locality where the proposed railway would run, and along its course about a hundred miles. He then proceeded due south, and joined the main camp at Mundrabilla. The distance covered by this trip was about 200 miles, and occupied about 10 days. From Mundrabilla to Eucla, some 70 miles, the same procedure was adopted, Mr. Babington taking the main caravan along the coast line, while he (the speaker) inspected the country inland. On July 20 they reached Eucla, the men and camels being in good condition. They spelled there for nine days, and during that time he received instructions to examine the country lying between Kalgoorlie and Tarcoola in a direct line. They left Eucla on July 29, with a probability for them that they would have to traverse between 300 and 400 miles of the waterless country. They went due northwards for 50 miles, which brought them into the 31st parallel of latitude; thence they travelled in a westerly direction. They kept on this course continually for 12 days, covering in the time about 280 miles before they struck water, notwithstanding that they had been prospecting to the northward and southward constantly for it. A rock-hole was discovered by Mr. Babington on the twelfth day, which held about 300 gallons. That supply only permitted them giving the camels half a drink. After leaving the rock-hole three or four more similar holes were found in the next 30 miles, one of which must have held fully 10,000 gallons. At that hole they spelled for four or five days, and examined the country lying to the north and south for about 30 miles, and then proceeded westward to Goddard's Creek, which they reached on August 20. From Goddard's Creek they practically followed their old tracks back to Cardinia, keeping due west from there until they struck the Mt. Monger track, some 20 miles south of Bulong, reaching the latter place on August 28. For the first 100 miles traversed the country was auriferous, and well timbered with salmon gum and other timbers. A limestone plain was then entered, which extended right on to the South Australian border. The plain country comprised good pastoral well-grassed land, but

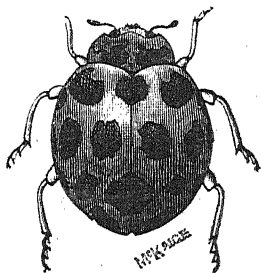
was apparently waterless. The growth of grass and herbage was excellent throughout, although there had been a long drought previous to their visit. On the whole they experienced no serious difficulties throughout the trip. The equipment was everything that could be desired, and although they took with them a well-stocked medicine chest it was never called into requisition. Every member of the party rendered him the utmost assistance in his power, and carried out his duties in a cheerful, willing, and able manner. They were, however, not sorry to get back to civilisation, a more frequent wash, and less tinned beef." (Applause.)

TASMANIAN LADYBIRDS.

Mr. A. M. Lea, Government Entomologist of Tasmania, and once Entomologist to the Department of Agriculture of Western Australia, has set to himself the task of establishing in this State a few ladybird insects, which abound in Tasmania, and should prove a great help in keeping our gardens clear of aphides and scales.

By last mail another consignment of two of the most rapacious ladybirds was received, being the fourth successfully introduced this winter from Tasmania, they are the *Leis conformis* and the *Orcus bilunulatus*. They were, like the preceding lots, liberated in some of our orchards where scales and aphides are prevalent.

"To-day," says Mr. Lea, "I am sending the last consignment of ladybirds this winter. In consequence of the warm days the masses that were hibernating have broken up, and I do not think that any more are to be found. I would have liked to have left them till September, when they would have had a better chance in the West, but, as we had so many warm days, I thought it best to send them away at once. I have now sent several hundreds of thousands away this winter—*Leis conformis* and *Orcus bilunulatus* to Western Australia; *Orcus Australasia*, *O. bilunulatus*, and *Leis conformis* to England; and *O. bilunulatus* to California. Whilst Mr. Compère was in Australia I saw *Halysia mellyi* hibernating in the North in masses, and did not interfere with them, as I thought he would come for them himself. I am sorry now that I did not send them either to California or England; it would have been useless sending them to W.A., as the species already exists there. During the past three winters I have hunted all over the island to find ladybirds hibernating in masses without the least success; this season I was shown three separate places where they were nicely settled for the winter. One place consisted of only *Leis conformis*, one only *Orcus bilunulatus*, and one of *O. Australasia* and *Leis conformis* mixed; next winter I may have



LEIS CONFORMIS
(4 Diameters.)

even better luck, as several people are on the look-out for them for me. Not yet heard how the British and American lots got on, but, considering the time of the year they were obtained, I think they should stand the journey very well; those sent to the West seem to have arrived all right. *Leis conformis* I have seen clear a peach tree of aphid in less than a week, and, I think, in this colony it is very largely responsible for keeping the woolly aphid in check; it has also been seen to actually pull out codlin grub from apples. I reckon it is the most useful ladybird we have, and was awfully disappointed at not establishing it in my time in Western Australia. I do not suppose, however, that I received more than two or three hundred specimens all the time I was there, and those were always in the autumn—the worst time of the year. The sparrows and silver-eyes are very fond of it."

A good deal of interest, states Mr. Despeissis, is being shown by our growers in the work and welfare of the ladybirds prevalent in this colony, and numerous specimens are from time to time posted to the Department from even the most distant centres, such as Esperance and Cue. Mr. E. M. Clarke, M.L.C., at his orchard at Brunswick, finds they are very efficient in keeping his citrus trees clean. He has designed for them artificial shelter for the winter; these consist of little shelves made of two pieces of thin board set with a narrow space between them, and which are placed among the branches of the trees they visit; in these shelters they hibernate, and come out again when spring comes round. Both in the pupa and in the perfect insect stages they, without hardly pausing, feed on scales and on aphides.

SKIM-MILK CALVES IN THE FEED LOT.

Feeders find that the average skim-milk calf does not make profitable gains in the feed lot, and will not buy him. Farmers find that the difference in price between an ordinary skim-milk calf and one that has run with the cow is frequently greater than the profits made from milking, and they drop dairy work.

The Kansas Experiment Station during the past winter fattened 130 head of calves for baby beef. These were divided into nine lots—one lot of ten had been raised by hand with skim-milk, and another lot of ten had run with their dams in small pastures until weaning. Both lots were put in fattening yards at weaning, and were fed for seven months on alfalfa hay and corn. The results are as follows:—

	Average gain per head.		Feed for 100 pounds gain.	
	Pounds.		Corn.	Alfalfa.
Calves raised with dam	...	435	...	475
Skim-milk calves	...	440	...	439
				472
				436

Corn costs 40 cents a bushel, and alfalfa hay \$8 (£1 13s. 4d.) a ton, making the cost of each 100 pounds gain \$5.28 (£1 2s.) for

calves raised with their dams, and \$4.88 (£1 os. 4d.) for the skim-milk calves. The calves when fattened were shipped to Kansas City, the steers in each lot bringing \$5.40 (£1 2s. 6d.) per hundred, and the heifers \$5.15 (£1 1s. 5½d.) The packers paid the same price for the fattened skim-milk calves that they did for the others. In this trial the skim-milk calves made the greater gain, gains at the least cost, and made the most profit.

We attribute the good showing made by the skim-milk calves to the fact that at weaning time they were already on grain feed, they did not worry at loss of their dams as did the other calves, and they were perfectly tame.

The skim-milk calves were fed until weaning on sterilized skim-milk, with a grain ration composed of equal parts of corn and Kafir-corn, with all the alfalfa hay they would eat. They were fed in this way twenty-two weeks, and made an average daily gain of one and a half pounds per calf. The feed to raise these calves to weaning cost \$5.27 (£1 1s. 11½d. per) head. As the results show, they were in good condition for feeding when weaned, and the experiment shows strongly the good feeding qualities of the skim-milk calf, and the profits that can be made from it when the calf is properly handled from birth to weaning, and then pushed for baby beef.

The College herd of scrub cows, bought without regard to their value for the dairy, produced in a year, at creamery prices, milk worth \$37.75 (£7 17s. 3½d.) per cow. The skim-milk calves, which were fattened in this experiment, were of mixed breeding, and were selected without regard to their value for the production of baby beef. They brought an average of \$40 (£8 3s. 4d.) each when marketed at about a year old. This shows a gross income in a year from a scrub cow and a scrub calf of \$77.75 (£16 4s. 11½d.), when both cow and calf are pushed, the cow's milk sold, and the calf raised on skim-milk.

The best cow in the scrub herd produced milk in a year worth, at creamery prices, \$60.88 (£12 13s. 8d.) The best calf in the skim-milk lot brought \$47 (£9 15s. 10d.) This shows that a good scrub cow with a good calf could be made to bring over \$100 (£20 16s. 8d.) gross income in a year. With large grade Short-horn or Hereford cows of the dairy type crossed with a short-legged, thick-meated, blocky bull, the returns from both cow and calf would undoubtedly be much greater, making the combination of dairying and baby beef very profitable.

H. M. COTTRELL, Experiment Station, Manhattan, Kan.

One of the greatest of really practical inventions of our day is that of a motor plough, which is to plough 30 acres per day under the control of one man. The inventor is the venerable American, Dr. Gatling, of Gatling gun fame. The invention is to be exploited by a St. Louis company.

GRAFTING.

BY A. DESPEISSIS.

This operation consists in inserting into the root, the stem, or the branch, as the case may be, of a plant host, known as the *stock*, a part of another plant, which is called the *scion*. It is performed in a manner, and under conditions such that they unite, and the scion will derive from his host the stock the nourishment necessary for its growth, and will bear fruit of the kind belonging to the plant from which it was taken. On some idea of the circumstances which make grafting practicable, and of the methods suitable to the performance of this operation depend the success or the failure of the graft. To be successful grafting must be made with the right kind of wood. The stock and the scion must be botanically related; the closer the relationship the more successful the graft. Grafting is not practicable on all kinds of plants, but is restricted to those botanically known as *exogenous* plants, which are possessed of pith, wood, and bark, and grow outwardly. This term is used in contradistinction to that of *endogenous*, which refers to a class of plants which increase by internal growth and elongation at the summit instead of externally, and have no pith, wood, and bark. Reeds, palms, and cereals belong to this order, and for the reason referred to cannot be grafted.

In order that grafting may be successful the growing tissues of both stock and scion must be closely fitted together, so that the nourishing fluid may be forced by one into the other. For such an interchange to take place the growing tissues of each must be fresh, sound, and gorged with moving sap; the tissues conveying such sap must be in contact. These tissues are botanically known as *cambium*, a word which means "exchange." It consists of a layer of extremely delicate tissue formed between the wood and the bark. The cells of this tissue have very thin walls, and they are filled with protoplasm, or organisable nutrient matter. It shows like a thin film of mucilage. These cells develop on the one side into sap-wood or *alburnum*, which means "whitish," and on the other side into new bark, whilst, at the same time, fresh cambium is formed for the continuation of the work.

It can thus be understood why endogenous plants such as grasses, palms, etc., cannot be grafted.

OBJECTS OF GRAFTING.

This operation, which has been practised for ages without number, possesses advantages which are often availed of by the fruit grower.

1. It enables us to cultivate, on roots foreign to the plant itself, fruit trees, which, on their own roots, would fail to thrive in soils of some particular nature. Thus the pear on the quince, the peach on the plum or the almond, can be cultivated on a wider range of soils than would be practicable were they growing on their own roots.

2. It enables us to propagate plants which could not be propagated true to name from seeds. This is the case with most highly improved fruit trees.

3. It is an easy and a valuable means of rapidly propagating some sorts of plants, and of obtaining a large amount of wood from a shoot of a rare or choice variety.

4. It also enables us to combat blights and pests by using either roots or top of varieties little subject, or not liable to, the attacks of such pests. Thus, most apples are now worked on roots of the Northern Spy, the Winter Majetin, the Duchess of Oldenburg, or some other recognised varieties proof against the woolly aphis, and also the choicer European vines are grafted on phylloxera resistant vines.

5. It is a valuable means of speedily obtaining large trees of kinds by working scions of such kinds on the top of high stems.

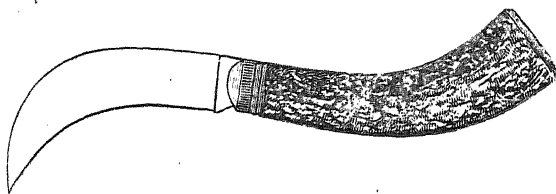
6. It is a ready means of replacing varieties of little or no value possessing vigorous roots and substituting for their tops varieties better adapted to one's requirements.

7. It is also often practised for uniting on the same stock branches of unisexual trees, or of plants, which need be within reasonable proximity to become fruitful. This plan is recommended in the case of the Smyrna fig, which is sterile unless fertilized by the blastophaga wasp, which dwells within the Capri fig.

GRAFTING TOOLS AND MATERIALS.

A saw, a pocket knife and a chisel, dexterously used, are often the only tools used for grafting. Those tools, however, best suited for the work have been described in the chapter on pruning.

The knife, which is used for cutting and facing and preparing

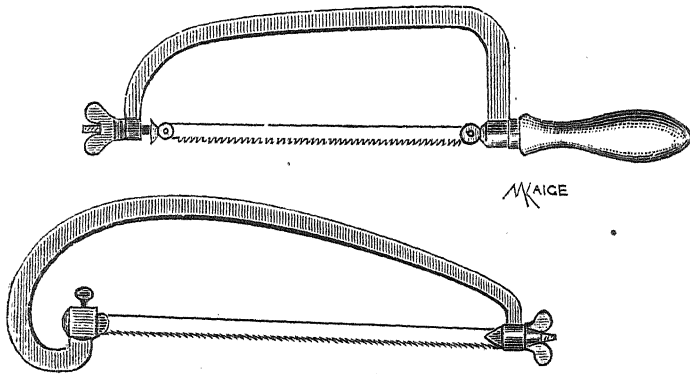


Grafting knife.

the grafts, should be kept sharp, so as to make a clean cut.

The saws should be thin, fine-toothed tools, set wide, so as not to clog. They should be kept well set.

Two good patterns of such saws are here illustrated. They are thus described by Mr. B. M. Lelong, the Secretary of the State Board of Horticulture of California. The lower one—a bow saw—is provided with a handle, which fits closely into the hand. Both ends of the blade are fastened by means of a little screw on to a bolt, having the other end riveted into a countersunk hole. The blade can thus be turned at any angle, or it may be kept in one position by tightening the thumb-screw at the end near the handle. Two small pieces of wood are riveted on either side of the bow at the lower end, which serves as a handle to prevent injury to the hand.



The bow is made of steel, and springs a little. These saws can be made by anyone, and for cutting large limbs have no equal, as the blade being thin and narrow, and the teeth set wide, will cut through a limb with great rapidity, without sticking or getting pinched in the cut—a difficulty met with in all other saws. The blade may be reversed if one chooses, and made to cut by drawing it instead of shoving. In this way they are not so readily broken.†

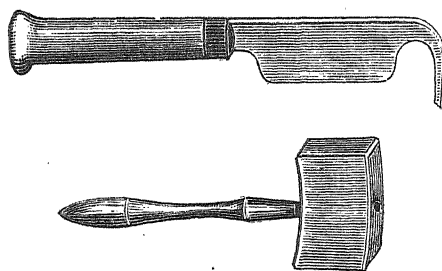
The top saw is another pattern, this one having a handle about 16 inches long, and the blade guided by it. For using it the handle and bow are grasped together by the hand, which sometimes is very awkward, especially when the large limbs or a considerable number have to be cut. In any case it is more tiresome to the hand than the first one shown.

CHISEL AND Mallet.

For grafting stout branches a chisel and mallet are required. The figures illustrate convenient tools of that description. An old file can be turned by a blacksmith into a very serviceable chisel. The prong at the end is useful for keeping apart the split when the graft is inserted.

The mallet is not absolutely necessary, as any piece of wood

will do, but it is convenient, and one made of tough hardwood answers the purpose well. A hole is bored in the centre with an



augur, a handle driven right through, and a peg inserted through the projecting end of the handle at the other side, so as to prevent it coming off.

WAXING POT.

Where waxed cloth or waxed paper is not used, the grafts are smeared with plastic grafting wax, by means of a brush.

The proper consistency is obtained by placing lumps of the grafting wax in a "glue-pot." The vessel dips in a hot water bath, which is heated by means of an oil lamp placed underneath. The wax is thus kept soft, but is not exposed to burning, as it might should the pot be placed in direct contact with the flame.

GRAFTING WAX.

Several formulæ are given for the preparation of grafting wax. They all, however, contain beeswax, resin, and either tallow or raw (not boiled) linseed oil.

In warm regions, where the grafting wax is apt to run, raw linseed oil is often preferred to the tallow, and the proportion of resin is increased, whilst that of the beeswax is reduced, the cost being thereby also reduced.

Wax made of the following proportions, and well pulled, will not crack, and will be little affected by the weather:—

Beeswax	...	...	...	...	1 to 2 lbs.
Resin	...	...	...	...	4 lbs.
Tallow	...	...	...	...	1 lb.
or					
Raw Linseed Oil	...	...	...	...	$\frac{3}{4}$ pint.

Slowly melt all together, stirring well to cause the ingredients to better incorporate with one another. When ready to pull, in 15 to 20 minutes, pour into a bucket of cold water. Then grease the hands to prevent the wax sticking, and pull the wax until it becomes light yellow and tough. Make into balls of convenient size, and throw into a bucket of cold water to stiffen, and use when required. If too hard then, put a lump into warm water for a few minutes, and it can soon be worked with the hands. Some prefer to put the

wax on hot and in liquid form; a small paint brush is convenient for this purpose, but this method is more wasteful of material. The wax can be applied safely much warmer than can be borne by the hand, but should be well below the boiling point of water.

OTHER COVERINGS.

Gum shellac dissolved in alcohol is too expensive, and it also cracks.

Paint is not good as it contains oil, and that deadens the bark on the rim and does not heal very well.

Grafting clay is cheaper, and very serviceable. It is made of one-third part cow dung and two third parts of clay or clayey loam, with a little chopped hair—as used in plastering to prevent cracking. Beat and temper this for two or three days until it is thoroughly incorporated.

Waxed cloth or *waxed paper* are preferred by many to any of the foregoing. This material is got ready before the operation. When budding is practised it is to be recommended in preference to any other material, as it answers the double purpose of holding the bud or graft—and thus doing away with tying—and of excluding the air or moisture. It also prevents the bud or graft from drying.

Two parts of beeswax and one of resin are melted over the fire, and calico or strong muslin is dipped into it. When the cloth is saturated, all the superfluous hot wax is scraped off before the cloth cools. This is done by drawing and squeezing the cloth between two sticks, or between the melting pot and a stick. The cloth is then spread out to cool, after which it is torn, when required for use, into strips of one-quarter to one-half inch wide, and 10 to 12 inches long.

Some people roll old calico or thin muslin on a stick, and place it in melted wax. When saturated it is allowed to cool by being unrolled on a bench. It is then cut in strips to suit.

Tie bands.—The best of all ties is *Raphia* fibre, the cuticle of the leaves of the *Raphia* palm, which grows on low, swampy lands in Madagascar. It is damped before using, and does not cut the bark, on which it lies flat.

For tying grafts buried underground, *Raphia* should be steeped in a solution of sulphate of copper, which makes it more resistant to rot. This fibre is sold in bundles by all seedsmen.

The temperature to keep eggs for incubation should be about 45 to 50 deg. F.—the eggs should be turned three or four times a week—the lowest temperature that eggs could stand and then give a fair percentage of chicks. I set a hen on 12 eggs, she left them; I found the eggs, on the second morning after setting the hen, very cold, so I got a good thermometer and found that the eggs only registered 39 deg. For experiment I placed another hen on the eggs, and on the 22nd day I found she had brought out seven fine chicks.

"LARGE BLACK" PIGS.

Although, in a strict sense, the "Large Black" breed of pigs cannot be called a new breed, yet the term is not altogether inappropriate, as it is only since the organisation of the "Large Black" Pig Society, a year or two ago, that this breed has become known outside a comparatively circumscribed area. The "Large Blacks" came with the reputation of being hardy and vigorous, very prolific, and of a contented and good-tempered disposition. The boar and sow illustrated in this issue are well-known English prize winners, and are both represented in a boar and sow that have recently been imported into this State by Messrs. Richardson Bros., of Woorlooo. The sow, previous to despatch, was served by "Iford Masterpiece," another boar with an excellent show record.

The following is from a recent copy of the *Farm and Home* :—
 "The Large Black pig is a breed that is not at present kept largely in the pure state, but which is growing in popularity, and boasts a society and a herd-book specially devoted to its improvement. The secretary of the society is Mr. Ernest Prentice, of Ipswich, and, from a description written by him, we learn that the antiquity of the breed is beyond doubt, for there is ample evidence that the Large Black pig, with its characteristic whole colour, length, fine hair, 'lop ear,' and great grazing capacity, existed in many parts of the kingdom at a date long prior to the memory of any of the present generation of breeders. They have been continuously and carefully bred in Cornwall for upwards of 50 years, and for long periods in Devon, Essex, and Suffolk, while recently they have extended their district to Yorkshire, North Wales, and Sussex.

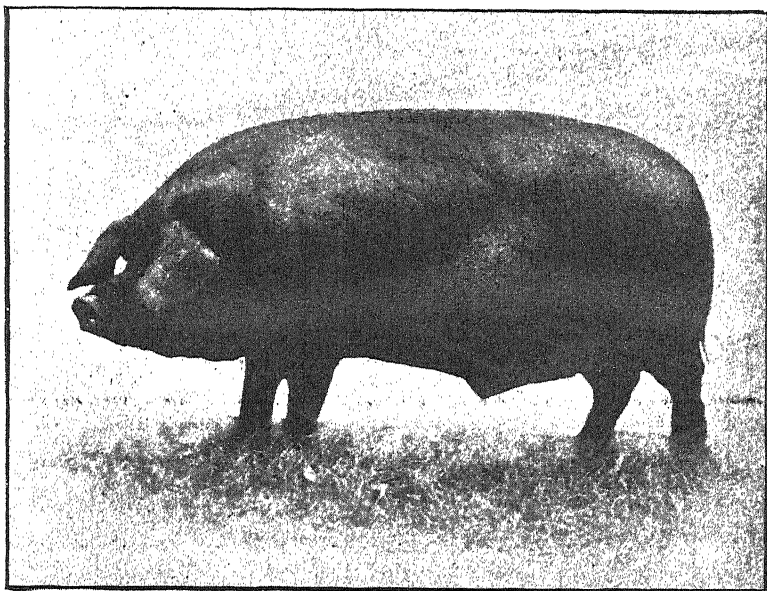
"With herds spread over so great an area, observes Mr. Prentice, and—in the absence of an association of breeders and the consequent herd-book—dependent on near neighbours for any change of blood in boars or sows, it is not surprising that there should be slight variations of type apparent between the stock of widely separated districts, but the difference is at the outset so slight that it may safely be predicted that the course of very few years will witness general uniformity. The west-country pigs possess the greater frame, whereas those of the eastern district are possibly more hardy and prolific, and the exchange of blood which is likely to result must be of immense benefit to both parties. A breed which has weathered the storm of agricultural distress, and is to-day found to be so largely in favour as a commercial adjunct to the tenant-farmers' holding, must possess the all-important quality of utility in a great degree, and there can be no doubt but that it is this quality which has conduced to the survival of the Large Black pig, and to its present prominence as the animal best suited to the needs of the modern breeder, feeder, bacon-curer, and consumer. Five-and-twenty years ago Large Blacks were fed to enormous and, indeed, almost incredible weights, but, being in the

hands of men who had to study the market and supply a carcase which would meet the requirements of the times, the great weight has given way to greater quality, and the Large Black now yields at a very early age the chief desideratum, viz., a long, deep-sided carcase of 160 lb. to 190 lb. dead weight, light in shoulder, jowl, and offal, and showing a larger proportion of lean meat than any other breed. The pre-eminence of the breed in this respect was strikingly illustrated in the results of the carcase competition for swine held in connection with the Christmas show of the Suffolk Fat Cattle Club in 1899. Two classes, open to all breeds and crosses, were provided, the one being for 'Bacon pigs, live weight 190 lb. to 220 lb.,' and the other for 'Bacon pigs, live weight exceeding 220 lb. and not exceeding 280 lb.' Large Blacks were awarded first and second prizes in the first-named class, and first prize and reserve number in the class for heavier weights! Large Blacks are exceedingly docile in disposition, and the natural carriage of the ears, well forward over the eyes, is said to contribute materially to a quietness of habit which renders them peculiarly adapted to field grazing. Their colour also is claimed to be an advantage, as it enables them to be pastured or field fed during the summer months without suffering from sun scald. The excellent character which the breed bears for fecundity is visibly supported by the capacity with which the sows are endowed in respect to length and depth of carcase.

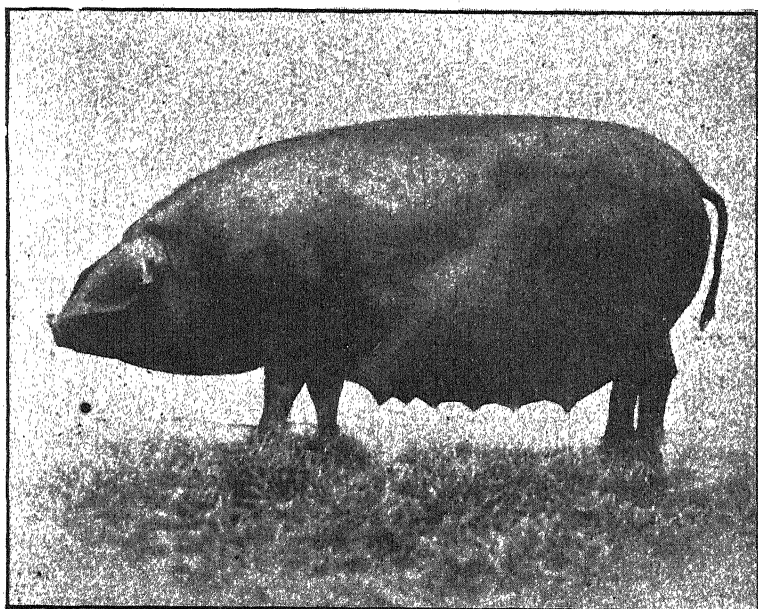
"The Large Black Pig Society was suggested early in 1898, and, at a meeting of breeders held upon the Royal Show ground, at Birmingham, in June, 1898, it was resolved that it was advisable to form a society to advance the interests of breeders, and to establish a Herd Book, a committee being appointed to carry out the preliminary work. At a meeting held at the Smithfield Club Show, in December of the same year, the name of the society was adopted, scale of points, articles of association, by-laws, etc., were formulated, and it was decided to incorporate the society under the Companies Acts. This was duly effected, the certificate of incorporation being dated April 18, 1899.

"Immediately following the announcement of the intention to form the society, a widespread demand for Large Blacks was experienced, and all known breeders—especially those who availed themselves of the advantages offered by the advertisement columns of the agricultural Press—have enjoyed a remunerative trade during the last 12 months. In addition to the inquiry for the United Kingdom, a number of Large Blacks have been exported to South Australia and Germany.

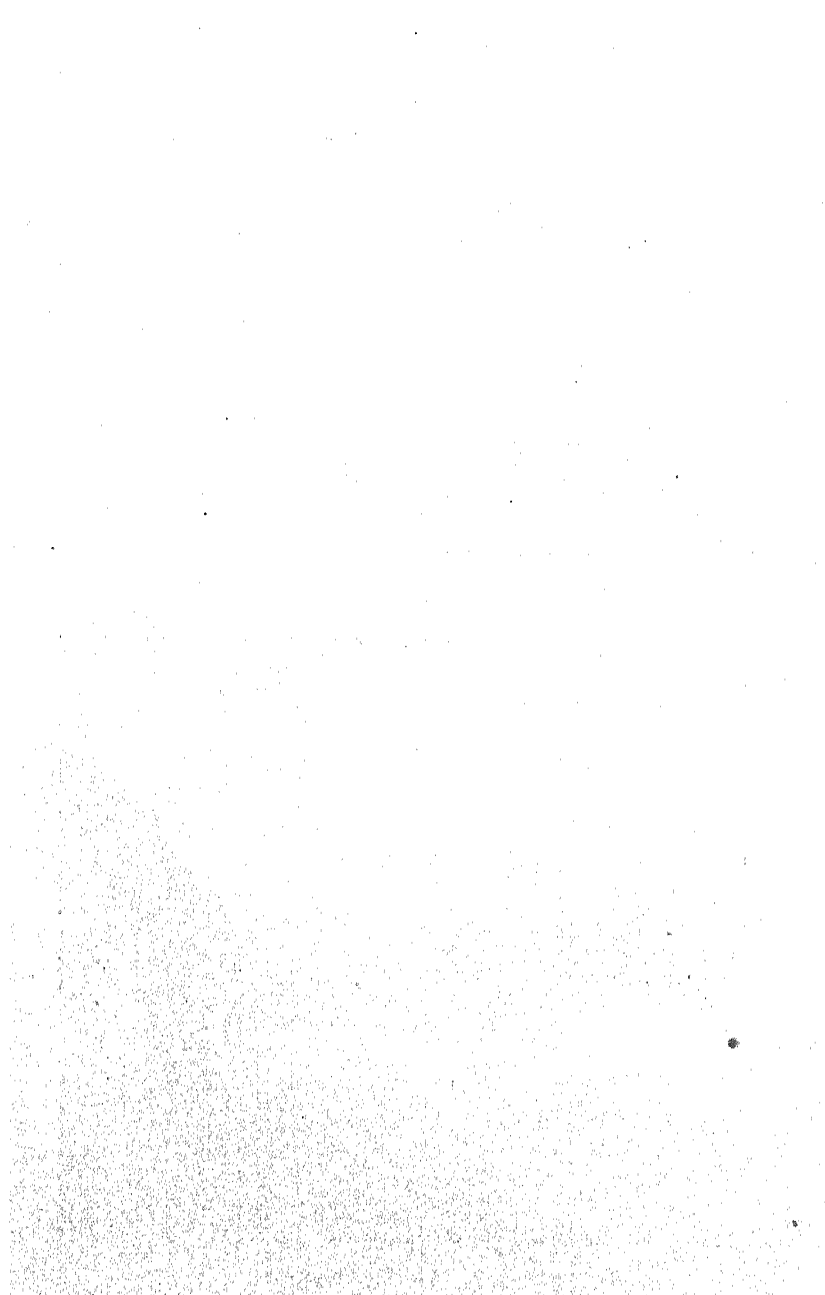
"In the showyard the representation of Large Blacks was, until recently, confined to exhibits in the classes provided by the Royal Cornwall Agricultural Society, the Devon Agricultural Society, the Suffolk Agricultural Association, and at various local shows, but the Royal Agricultural Society of England and Bath



WILLIAM THE CONQUEROR, 163. (See page 213.)



TRESCOWE SOOT, 568. (See page 213.)



and West Society have now acceded to the application for the inclusion of classes for the breed in their schedules of prizes.

"The scale of points is as follows :—

Head—medium length, and wide between the ears	...	5
Ears—long, thin, and inclined well over the face	...	6
Jowl—medium size	...	3
Neck—fairly long, and muscular	...	3
Chest—wide and deep	...	3
Shoulders—oblique, with narrow plate	...	6
Back—long and level (rising a little to centre of back not objected to)	...	12
Sides—very deep	...	10
Ribs—well-sprung	...	5
Loin—broad	...	5
Quarters—long, wide, and not drooping	...	8
Hams—large, and well-filled to hocks	...	10
Tail—set high, but not coarse	...	3
Legs—short and straight	...	5
Belly and flank—thick and well-filled	...	8
Skin—fine and soft	...	4
Coat—moderate quantity of straight, silky hair	...	4
Total	...	100

OBJECTIONS.

Head—narrow forehead or "dished nose,"
Ears—thick, coarse, or pricked.
Coat—coarse or curly; bristly mane.

DISQUALIFICATION.

Colour—any other than black.

GOVERNMENT IMPORTATION OF STOCK.

For some years past the Secretary to the Department of Agriculture has recommended the importation of stud stock by the Government for the purpose of improving the breeds of cattle, horses, and pigs in the State. During 1898 Mr. George Throssell, then Minister for Lands, approved of the purchase of some stud bulls for this purpose. Four Jersey and two Dexter bulls were imported. These bulls have since been lent to settlers on very favourable terms, and they have been largely availed of, with very satisfactory results. During 1900 four calves, the progeny of these bulls were purchased by the Department. A pure-bred shorthorn bull was purchased from Mr. McKenzie Grant, of the Newmarracarra Estate, during the year, and a Tamworth boar and two sows of the same breed were also imported. The above comprise the stud stock at the disposal of the Department at the present date.

The question of the importation of horses for stud purposes has been discussed by the Producers' Conference for several years past, and also the proposal to place a tax on stallions, but, up to the present year, no decided move has been made in this direction.

At the Producers' Conference, held last March, a resolution was proposed on behalf of the Northam Agricultural Society and

the Newtown Progress Association, and carried, to the effect that the time had now arrived when the Government should take steps to encourage the breeding of horses for army remount purposes, either by importing stallions and allowing their use in different centres at a low fee, or in any other manner that might be decided upon.

This resolution was brought before the Minister for Lands, Mr. C. Sommers, M.L.A., who decided to give effect to it by importing some pure-bred stud stock. Arrangements are now being made for the purchase of this stock, and it is hoped that they will arrive in this State in time to be paraded at the Royal Agricultural Show, to be held at Guildford next month, after which they will be available in the country districts.

The Secretary to the Department of Agriculture has supplied us with the following particulars of and opinions on the stock to be obtained, provided suitable well-bred animals of each class can be procured at a satisfactory price.

HORSES.

A Suffolk Punch Stallion.—This is essentially the type of horse required for general farm work. He is not too large, has clean legs, is well and strongly built, has great power of endurance, will perform more work and keep in better condition, and require less feed than the heavier breeds, such as Clydesdale and Shire horses. This breed is suitable for cart work, and is much sought after for artillery and transport service in the army, while they are capable of performing the heaviest farm work. The height should not be over 15.2 hands.

A Clydesdale Stallion.—Clydesdales are active draught horses, suitable for heavy dray and road work, and are invaluable to large carrying firms in the city. There is always a good demand for them at very satisfactory prices to the seller.

For the purpose of breeding remounts for army purposes—a class of horse in demand at the present time—a good hackney stallion is to be obtained, and also a Cleveland bay (if procurable). This is a very useful type of horse, and suitable for all kinds of coaching and road work. The horses of this breed are heavier than the thoroughbreds, and likely to have the effect of increasing the staying powers of the stock if put to good mares.

CATTLE.

One Dexter Kerry Bull and Two Heifers.—The two bulls of this breed in the State having proved to be admirably adapted for the South-West district, and being in constant demand, it was decided to increase the number.

Ayrshire Bull and Two Heifers.—The breed is one of the most useful for dairying purposes, and examples of it are unfortunately scarce in the State.

One Devon Bull and Two Heifers.—This breed is likely to prove a great acquisition to the State. It is very suitable for the South-West district, and is useful for both beef and milk. A few of this breed were in the State some years ago, but they seem to have quite died out.

PIGS.

One Tamworth Boar and Two Sows.—The demand for those already imported has been so great that more are needed.

One Berkshire Boar and Two Sows.—The Berkshires are great favourites among settlers, and in a short time the Department will have pedigree stock to dispose of to improve the existing studs.

One Poland-China Boar and Two Sows.—This breed is remarkable for its fattening qualities, and should prove a valuable addition to the stock of this State.

All the stock to be imported is to be inspected and passed by the Government Veterinary Surgeon in Victoria, and all cattle are to be subjected to the tubercule test before purchase.

With regard to the horses, it may be mentioned that during the last five years there have been imported into this State 16,159 horses, valued at £210,000. Most of these might have been raised within the State.

THE EASTERN STATES.

As to what is being done in this matter in other States and colonies, it is pointed out that the New Zealand Government have just imported a number of stallions to improve the breeds, and also a number of cattle for the same purpose. New South Wales has a stud stock farm, and also several experimental farms, at which stud cattle and pigs are bred, and the progeny sold to settlers. Bulls are also hired out under very easy conditions, and the services allowed at a nominal charge to stock brought to the farms for the purpose. Queensland also has stud cattle on the experimental farms. In Victoria the farmers are now agitating for the Government to import bulls for stud purposes. Queensland, New South Wales and Victoria are at the present time discussing the question of importing horses for stud purposes. Victoria has issued a circular to all agricultural societies, asking for their advice on the matter. The Department points out that all these States are better supplied in this respect than Western Australia. It is a profitable undertaking to travel a good stallion, owing to the demand for his services in those States.

IN OTHER COUNTRIES.

The National Stud Farm in Hungary is the largest in the world, and the annual amount spent is £116,000. In Austria there are stud farms that cost £120,000, and an annual appropriation of £40,000 for importing thoroughbred horses from other countries. The fees charged to farmers vary from 1s. 8d. to 16s. 8d., and the total amount received for fees amounts to £30,000 per annum. In France there are 22 national studs, which cost £290,000 per annum, and also £60,000 awarded in premiums for privately owned stallions. In India about 300 stallions are kept by the Government, and their services are given free to selected mares. In England the Government give £5,000 annually in fees and prizes for approved stallions, and also spend enormous sums in buying remounts for the army.

BLACK SPOT OF THE LOQUAT.

By A. DESPREISSIS.

To commercial interchange with the Eastern States we owe another disease of our orchard trees. The loquat, until lately, was, almost without exception, raised from seeds from locally grown fruit, and the plants were healthy.

Whether the disease was introduced by imported fruit or on nursery stock it is not easy to determine.

This blight is caused by a fungus closely allied to that which produces the scab disease of apples and pears, and its botanical name is *Fusicladium eriobotryal*.



Black Spot of the Loquat (*Fusicladium eriobotryal*.)

Diseased loquats were first submitted for identification by this Department in 1898. It has since been spreading, and this year it is reported to have done serious damage to the loquat crop at some gardens.

The fruit is attacked when half-grown by brownish black spots, which soon extend, stop the further development of the fruit, and disfigure its appearance. After a time brown spots show on the leaves, and assume a darker colour. The fleshy part of the fruit becomes dessicated, and the skin seems to cling to the stones. A large proportion of the crop, may, in a short space of time, be rendered absolutely unsaleable.

REMEDY.—Is the disease beyond control? Experiments in that direction have not yet proclaimed that fact; on the contrary, judging by analogy, and knowing how readily the *Fusicladium* fungus, or scab of the apple and the pear, and also of the vine, yield to treatment, there is every reason to augur that the black spot of the loquat likewise will be amenable to treatment.

That treatment must be protective, and cannot be curative, as the fruit once spotted can never be freed of the blemish.

Spraying with Bordeaux mixture soon after blossoming, when the petals have fallen and the fruit has just formed, should be found an effective protection. This treatment should be renewed when the fruit is half-grown, in the winter, when the weather is likely to remain fine for some time. If necessary a third spraying a fortnight after would copperplate the tree against an attack of the fungus.

The photograph, was taken by Mr. G. C. Baker, of this Department, and the specimen, both fruit and leaves, shows the disease at an advanced stage.

Collect and burn all diseased fruit, and sweep and burn the leaves as they fall from the tree.

I shall endeavour next year to test the value of Bordeaux mixture as well as other fungicide in dealing with this blight. Considering the wetness of the season when the disease appears I would favour the Bordeaux mixture modified by addition of molasses to ensure a better adherence to the trees.

DETERIORATION IN HORSES.

The late Sir Tatton Sykes ascribed the deterioration of our harness and saddle horses to four causes:—(1) The improvement of the roads in the principal horse-breeding districts of Northern England, whereby the saddle horse for attending fairs, etc., was displaced by the farmer's gig; (2) the repeal of the Statute which forbade the export of mares, which he considered had a far more injurious result than the improved roads; (3) the improved system of agriculture; when the virtue of bone manure was discovered farmers were able to raise crops on land which had theretofore not been worth cultivation, and to put Shorthorns and Leicester sheep on pastures which, in their natural poor state, had been given up to brood mares; (4) the spread of railways, which operated in the same way as the better roads.

THE ADVANTAGES OF SILO MAKING.

By F. G. S., IN *Hoard's Dairyman*.

There is one benefit that is always consequent on a severe drought, it turns the farmer's thoughts towards building a silo, and making provision for the next dry spell that is almost as certain as the return of summer. So long as forage is plenty, the question : Will it pay me to have a silo and feed ensilage ? is apt to remain unanswered, and the uncertainty comes from the knowledge that there are a few cases of failure in every locality, and one failure counts more than a long series of successes. Also every failure means a vigorous and active enemy for the silo, while its friends are very apt to feed ensilage and say nothing. It is difficult for the man who fails to consider that the failure may be in a poorly constructed silo or faulty management of the corn crop, and, consequently, there is a wholesale condemnation of the silo and all its contents.

But last thoughts are frequently the best, and the man who has suffered in pocket through one dry spell is apt to move a reconsideration and look on the silo with more favour.

There are good and sufficient reasons why silage should be more generally used. In the first place, if the silo is properly built, the corn crop can be preserved in nearly the same condition as when it is first cut. It retains that much-desired quality of succulence, is more palatable and easier handled than when cut and fed dry, and, what is of great importance, there is less loss of digestible nutrients than when the fodder is cut and stacked.

With the silo green food can be fed all through the winter season, and there is no doubt that green feed has more influence on the system of the animals than is indicated by its chemical analyses or digestibility. It is useless to inquire why it is so ; living cells have a way of their own in producing results which are beyond the reach of the scientific man. We may talk learnedly of relaxed system, cooling the blood, assisted circulation, or increased metabolism, but we are talking in a circle so far as expressing actually the relative actions of dry *versus* green fodder, but that the green food does contain something not to be expressed in per cents or separated by the chemist is undoubtedly true, and, as a consequence, we have a larger consumption of food, and a better physical condition when such food is given.

The only point from which the silo can be criticised is the question of waste from fermentation, and even this loss is under the control of the owner, to a large extent, and, with the proper precautions, may be reduced until it is almost a negligible quantity, and this especially so when we consider the serious losses which come from the exposure of corn fodder to wind and weather.

Experiments have shown that, under good conditions of harvesting and keeping, corn fodder will lose, frequently, 30 per cent., and sometimes, under adverse conditions, as high as 50 per cent. of its feeding value, to say nothing of the fact that in feeding dry fodder a large amount of the coarser parts of the stalks are left uneaten. All these losses, when added together, make a heavy debit account against the feeding of the corn crop in the form of dry fodder.

On the other hand the silo will supply a succulent feed, with a low waste, if the silo is tight, and with no uneaten remnants.

The balance is so heavily in favor of the silo as an economical food preserver, that it is strange that its introduction has been so slow and its progress so moderate.

The results of a long series of experiments have established the following facts:—

The silo enables one to save the maximum amount of food with the smallest expenditure of labor, loss of feeding value, and at a smaller cost than by any other method.

The round silo, made from staves and well hooped, is the cheapest to make, but it may be the more expensive in the end on account of the liability of leakage, and consequent heavy loss of nutrients.

The average weight of a cubic foot of silage is about 45 pounds; but it will vary according to the part of the silo from which it is taken, from 18lbs. at the top to 60lbs. at the bottom of a silo 36ft. deep.

Thirty to forty pounds per day is enough for a 1,000-pound cow; but it should be fed according to the cow, and not her weight, as there is often a decided variation in appetite, amount used, and returns in milk. For this reason, feed the cow according to her deserts, and not always according to her size.

Silage is supposed to be fed for 180 days, or through the months when grass is not obtainable, but the dairyman who only provides for the winter months is not obtaining the greatest good from his silo. Taking pastures as they run, there is hardly more than two months in summer when sufficient grass can be depended on for a full ration. Sufficient provision should be made for nine or ten months of silage feeding, if it is wished to obtain the largest cash return for money and labor invested in the herd.

Put the corn into the silo when it is just passing out of the roasting ear stage, if it is flint corn, and when it is dented, if it is of the dent variety. If it is put in too early, when the corn is green and contains a large per cent. of water, sour silage is the result; if held until the corn is too old, the silage will mould, or sometimes heat sufficiently to char. A tight silo, and corn at the proper stage, will always give good returns, while a leaking silo, and corn immature or too old, will always result in failure.

GARDEN NOTES FOR SEPTEMBER.

By PERCY G. WICKEN.

The present month may be looked upon as the spring month of the year, when most of the seeds already germinated will make a rapid growth, and all seeds planted will begin to appear above the ground in a very short space of time.

Frosts may now be said to be a thing of the past, and many of the more tender plants may be planted in the open without risk. Plants that have been raised in pots or under glass may now be planted out. This being the best month of the year for planting out all kinds of summer vegetables, the most should be made of the time. The land requires to be well worked up, and the surface as smooth and level as can be obtained; a liberal supply of well-rotted stable manure should be dug in and well mixed with the soil; this helps to keep the soil moist, as well as supplying the necessary food for the plants. If stable manure cannot be obtained artificial manure must be used, but the application of a dressing of manure is necessary to produce good and quickly-grown vegetables.

ASPARAGUS.—May still be planted in the cooler districts of the State, but in the warm localities the shoots will have already started into growth.

ARTICHOKES.—May still be sown, and are worth growing for food for stock, as well as for table use.

BEANS (French or Kidney).—All varieties of French or Runner Beans may be sown. The dwarf varieties are the easiest for growing, as they do not require staking, but the runner beans can be kept down by pinching back. Too many rows should not be sown at one time, but a row or two each week to keep up a succession.

BEET.—Both red and silver beet may be sown; the seed takes some time to germinate, and is better if soaked for some twelve hours before sowing. Plant in rows 18 to 24 inches apart.

CABBAGE.—Sow a little seed in a seed bed, and shelter from the sun and keep the bed moist; when the plants begin to come up the covering must be removed or the plants will become weak and feeble. The St. John's Day is one of the best varieties for summer. Cabbage that are now well up should receive a top-dressing of sulphate of ammonia or nitrate of soda, applied, if possible, just before a shower of rain.

CAPE GOOSEBERRY.—Seeds may be sown in beds in the open and transplanted later on.

CUCUMBERS.—Cucumbers may be sown in the open, but in the cooler parts may require to be shaded at night. After the ground is ploughed the hills should be well worked up with hoes to

a depth of 18 inches, and about 3 feet in diameter; these hills should be about 8 feet apart each way. A quantity of manure should be worked into each hill before sowing the seed; about a dozen seeds should be sown in each hill and covered to a depth of $\frac{1}{2}$ -inch. When up thin out to six plants; keep a look-out for cut worms, which are very destructive at this stage.

ROCK MELONS.—These can be sown at the end of the month, and require about the same treatment as cucumbers.

ONIONS.—Sow a few seeds in seed bed for future use, and plant out those in the beds that are ready.

PEAS.—Sow a few rows of quick-growing varieties in the cooler districts.

POTATOES.—If potatoes are not already planted they should be put in at once, as it is now getting late. Use medium size, healthy potatoes, free from scab; plant about 6 inches deep, in rows 3 feet apart and 16 inches in the rows. They require a good supply of stable manure placed in the drill, and also some artificial manure containing a good percentage of potash.

PUMPKINS AND MARROWS.—Early varieties should be sown; the hills should be made in well worked land, all couch grass and other weeds taken out, and a handful of superphosphate worked into each hill before sowing the seed. For strong running varieties the hills should be 12 feet apart each way, while for the more bushy varieties 8 x 8 feet, or 6 x 6 feet is often sufficient. There are a great number of varieties of pumpkins and squashes to choose from, but the Ironbark is about the best for table.

SWEET POTATOES.—Place tubers in seed bed to obtain cuttings if you have not already done so.

TOMATOES.—The main crop plants should now be ready for transplanting, and should be planted out as soon as possible; a little more seed may be sown to plant out later on.

WATER MELONS.—May now be sown; they should be planted the same as described for pumpkins. There are a great number of varieties. They should not be planted in the same garden as preserving melons, as they become cross-fertilized with them and are useless.

FARM.—Work on the farm should now be brisk preparing the land for the sowing of the summer crops. Sugar beets and mangels, if not already sown, should be put in without delay, as it is getting late. Maize may be sown for grain and green fodder; the best varieties for grain are Golden King and Golden Surprise, and for green fodder the white varieties, Hickory King and Giant Caragua. Sorghum for early feed and seed, Hungarian Millet, Buckwheat, Sunflowers, and Chicory should all be sown during the month. A good crop of pumpkins and melons should be sown; these are a very profitable crop, easy to harvest, and require very little attention when once sown. Land should be prepared for sowing next month such crops as cow peas, lima beans, soy beans, etc.,

which are a very valuable crop for improving the soil. Lucerne can still be sown in the moister districts where the land is thoroughly cleaned; it is useless to sow lucerne on soil that is full of weeds. The present time is a very good one for sowing the Golden Crown Grass (*Paspalum dilatatum*). This seed can now be obtained in quantities in Perth at a rate that places it within the means of everybody, and is a grass that should be planted by every farmer who requires summer feed for his stock.

EXPERIMENTAL POTATO PLANTING.

In April last the seed of some thirty-eight varieties of potatoes were sent to Mr. Chas. Harper, of Guildford, who planted 11 sets of each at his own place. They have now been dug up, with the following results:—Breisis Prolific, $4\frac{1}{2}$ lbs.; Ruby, 11 lbs.; Edgecote Purple, $3\frac{1}{2}$ lbs.; French Russet, $12\frac{1}{2}$ lbs.; Early Peachblow, $5\frac{1}{2}$ lbs.; Satisfaction, 13 lbs.; Snowflake, $10\frac{1}{2}$ lbs.; Mottled Beauty, 3 lbs.; Eighty-fold, 9 lbs.; Vicar of Laleham, 9 lbs.; The General, $10\frac{1}{2}$ lbs.; Manhattan, $13\frac{1}{2}$ lbs.; La Brettone, $13\frac{1}{2}$ lbs.; Queer Fellow, $14\frac{1}{2}$ lbs.; Irish Flounder, $19\frac{1}{2}$ lbs.; Bliss's Triumph, $15\frac{1}{2}$ lbs.; Blue-eyed Russet, $14\frac{1}{2}$ lbs.; Magnum Bonum, 14 lbs.; Up-to-date, 19 lbs.; Snowdrop, $10\frac{1}{2}$ lbs.; Emperor, $15\frac{1}{2}$ lbs.; Early Puritan, $18\frac{1}{2}$ lbs.; La Czarine, $10\frac{1}{2}$ lbs.; Brownwell's Beauty, $15\frac{1}{2}$ lbs.; The Freeman, failed; Cambridge Kidney, 14 lbs.; Federation, $4\frac{1}{2}$ lbs.; The Bruce, 9 lbs.; Congo Curious, failed; Sanspariel, $6\frac{1}{2}$ lbs.; Snowball, $8\frac{1}{2}$ lbs.; Sanspariel, $6\frac{1}{2}$ lbs.; Anderson's Eclipse, $3\frac{1}{2}$ lbs.; Early Rose, $10\frac{1}{2}$ lbs.; Blue Derwent, 3 lbs.; Red Sausage, 14 lbs.; Harbinger, $10\frac{1}{2}$ lbs.; Centennial, $4\frac{1}{2}$ lbs.

PASPALUM DILATATUM.

As notified by advertisement elsewhere, Messrs. Sandover and Co. have now secured a stock of this valuable grass seed, and are prepared to supply customers at the low rate of 2s. per lb. for small quantities, or 1s. 9d. per lb. in $\frac{1}{2}$ -cwt. lots. This price is the lowest yet quoted, and is as low as good seed can be obtained at, thus placing it within the means of all settlers to try a small area of this valuable grass.

There is an industry that is carried on extensively in the Touraine district of France, namely, the breeding of mules. For a really good specimen of this class of animal as much as £60 is frequently obtained, whilst the average price is good, namely, about £30 or £40. They are not used to any great extent in this part of the country, but are bred for exportation to Spain, where they are very much in demand.

ANSWERS TO CORRESPONDENTS.

Mr. J. Deane Hammond, Beverley, writes:—"By rail I am sending you some plants of *Paspalum Dilatatum*. These have been propagated from sets planted last year, produced from seed I got from you two years ago. I have gone to some trouble with the grass to give it a fair trial, and am disappointed. Will you kindly let me know if the plants I am sending are a fair sample of what plants that age should be. Respecting the feeding properties, there have been practically none in any of the few hundred plants I have growing. They looked withered in the summer, notwithstanding they are in a favorable spot on the bank of a gully. I might say a few hundred plants of lucerne, treated in a similar manner, have done splendidly. This has been fed off three or four times, and never showed any signs of dying off. In both cases the plants were set in rows, three feet apart, and three feet between each plant. The weeds in each case were kept down by means of the horse hoe and hand hoeing. By the accounts I read of Mr. Crawford and others of this *Paspalum*, my results, at any rate, are far from the glowing accounts they gave of this grass. Have I erred in any respect? What is needed in the Eastern districts is a grass that will stand our dry summer without any pampering." Mr. Wicken, the Field Officer of the Department, replies:—"These roots to hand, and to all appearances appear to have done fairly well. If only put out from cuttings last spring, they have made a very fair root hold, and should make a good growth this summer. I would like to point out that *Paspalum Dilatatum* is not a winter grass, and makes very little growth during the winter, and does not begin to make much growth until the weather becomes warm. As to whether any local conditions act against the growth of the plant I am unable to say without making an investigation."

Mr. J. Milligan, Ferguson River, writes:—"I am sending you a parcel of grass for identification. Horses eating it are affected across the loins and shoulders. I have two very bad now. Can you tell me what to do for a cure?" In reply, Dr. Morrison, the Botanist to the Department, says:—"The plant received is *Stypandou gianca*, the Blind-grass, a native of the Eastern States, as well as of this, though associated with poisoning in Western Australia only. It has been for many years blamed for producing blindness in horses, and also for producing paralysis of the shoulder, and the testimony associating the plant with these effects appears too consistent to leave room for doubt as to its poisonous nature. The poison seems to have a special action on the spinal marrow, from its affecting the muscles of the forequarters of the beast, and its effect on the vision is possibly due to the toxic action on the same portion of the marrow, namely, that between the head and shoulders. Mr. Milligan says that very few horses get over it that get it in the loins, which appears to indicate that the poison acts preferentially on the upper part of the spinal cord, and in stronger doses extends its action downwards to the part in connection with the hind limbs. Mr. Milligan makes the interesting note that you cannot bend the leg affected, which suggests that the form of paralysis caused by the poison is of a spasmodic character, leading to stiffening of the limb from excessive muscular action; although in later stages this condition may be replaced by muscular weakness, as generally understood by the word 'paralysis.' He seems to say, also, that the skin breaks at the back of the shoulder, and if that is his meaning it would seem to show that the poison affects the nutrition of the body, as well as the muscles. As to treatment, if the advice of a veterinary surgeon is not available, I would suggest clearing out the stomach and bowels with a purge of salts first of all, then if the muscles are stiff with spasm, medicine to overcome that could be given. It would be of special interest to know the condition of the eyes of horses affected, whether the pupil is enlarged or contracted." The matter being referred to the Government Veterinary Surgeon, Mr. Weir replies:—"Give immediately one (1) pint raw linseed oil, followed by stimulants, whisky, two to four wineglassfuls in water twice daily, or Nux Vomica, two to four drachms twice daily. Feed on mashes of bran, linseed and chaff, and exercise the animal if possible."

MARKET REPORT.

FOR MONTH ENDING SEPTEMBER 5.

The W.A. General Produce Co. report sales effected for the following articles, on account of various consignees, for the month ending September 5:—Business for the past month has been fairly brisk, supplies very fair. Bacon, becoming scarce on spot, as the after effects of several previous rises at sources of supply. Hams, rather slow sale of late. Butter, reports to hand from Melbourne indicate supplies being much on the increase, and values easing in consequence. Lard has been extremely scarce, and practically few or no sales taken place. Cheese, N.Z., mild lots selling well. Eggs, local, very plentiful, values easing considerably. Potatoes, ruling very firm. Onions, market quite bare, expect consignment next week. Chaff, supplies of good quality not over plentiful, therefore have enquiries for prime lots at quotations. Bran and pollard unaltered in price, demand very good. Flour, local, rather scarce, imported lots arriving freely. Oats, sales limited, prices very firm still. Wheat, regular sales. Oilcake, very little to offer. Wheat, a little of the local article coming along, but imported lots are very plentiful just now, and prices ruling extremely low. Vegetables, full supplies. Carcase pork, good, cleanly dressed, sells very well. Butcher's requisites, fair business for the week. Artificial manures in constant demand; also various seeds. Poultry, very good demand for good table birds.

Farm and Dairy Produce.—Bacon, sides—10½d, 10½d to 11d per lb. Hams—rs, rs 1d to rs 2d per lb. Butter—Victorian, rs 5d to rs 6d; New Zealand, rs 4d to rs 4½d per lb., easing. Cheese—New Zealand mild lots, 8½d to 9d per lb; matured lots, 6½d to 7½d per lb. Eggs—Local, 11d, rs to rs 1d per doz. Potatoes—Imported, £10 to £10 10s per ton. Onions—*Nil*, worth 21s per cwt. Chaff—Worth from £3 15s to £4 10s per ton. Bran and pollard—£6 15s to £7 10s per ton. Flour—Imported or local, £9 5s to £10 per ton. Oats—3s 6d to 3s 8d per bushel. Maize—Whole, 5s per bushel. Wheat—4s 3d to 4s 6d per bushel. Oilcake—8s 6d per cwt.

Fruit and Vegetables.—Oranges Local, 7s to 10s per case; imported, 5s, 7s to 10s 6d per case. Lemons—Worth from 3s 6d to 5s per case. Mandarines—Imported, from 3s to 7s per case. Loquats—From 3s to 9s per case. Bananas—Worth from 8s, 12s, 15s to 22s per case. Passion Fruit—Worth 10s to 12s per case. Pine Apples—Worth 4s to 6s, and 12s per case. Apples—Imported, worth from 4s, 6s, 8s, to 10s 6d per case; choice, up to 13s 6d per case. Cabbage—Worth from rs 6d per bag to 2s 6d, 4s, 6s per cwt. Cauliflowers—Worth from rs to 3s and 6s per doz. Carrots and parsnips—rs 3d to rs 6d per dozen bunches. Turnips—Whites and Swedes, very plentiful, few only selling at very poor prices. Peas—2½d to 4d per lb. Rhubarb—Worth from 2d to 3½d per lb. Lettuce—Worth 6d to 8d per dozen. Spring Onions—Worth 6s per dozen bunches. Beetroot—Worth rs 6d to rs 9d per dozen bunches. Celery—Worth rs 6d to 2s per dozen heads. Cress—Worth 6s per dozen bunches. Thyme, Marjoram, Sage—Off stork, 9d to rs per lb. Mint—6d per lb.

Poultry.—Fowls—Table, best, 6s per pair; others, from 4s to 5s 6d per pair. Chickens—3s to 3s 6d per pair. Ducks—7s to 9s per pair. Geese—Worth 10s to 13s per pair. Turkeys—Gobblers, 18s to 22s per pair; hens, 14s to 16s per pair. Kangaroo meat and kangaroo tails—3d to 4d per lb. Carcase meat—Pork, 40 to 60lbs, prime, 6½d per lb; others, from 5d per lb. Lamb and veal—Many inquiries for live stock or dressed.

Sundries.—Bonedust—£7 to £7 10s per ton. Phosphate—£5 per ton. Superphosphate—£6 10s per ton. Guano—£5 10s per ton. Coarse baconsalt—£3 3s per ton. New corn sacks—7s 6d per dozen; secondhand, 4s 6d dozen. New bran bags—4s 9d per dozen; secondhand, 3s 6d per dozen. Pork skins, rs 4d per lb. Mutton skins—rs 3d per lb. Skewers—7s per 1,000. Antiseptics—rs 6d per gallon. Preservative—rs. per lb. Saltpetre—35s per cwt.

THE CLIMATE OF WESTERN AUSTRALIA DURING AUGUST, 1901.

The climate of the month was, on the whole, fairly normal throughout the State, except in the extreme S.W., where it was unusually wet; in fact during the first 25 days rain fell on 24, upwards of an inch for the 24 hours being registered on three occasions. An unusual barometric development occurred during the last portion of the month.

An ordinary winter "low," of no great apparent intensity, passed our South Coast on the 30th and 31st, but, finding its progress stopped by a strong anti-cyclone in the neighbourhood of Tasmania, it went inland, giving grand rains to the dry parts of the Eastern States, and eventually left Australia near Cape Howe on 26th. This unusual course may have had something to do with the abnormal and unpleasant weather experienced in the southern portions of this State on the 25th, 26th, and 27th. The first of these days was by far the "wettest" day on record since the pluviograph was mounted in April, 1897. The number of hours actual rainfall between 9 a.m. on the 25th and 9 a.m. on the 26th was 17.4, the greatest number previously recorded being 10.2 in June, 1900. Following this were two days during which a very cold E. and S.E. wind was blowing, and then the weather commenced to moderate.

Frosts were not so severe as in the previous month, but low readings were occasionally registered on the surface of the ground, the minimum for the month being 24.0 at Katanning. The following table shows the daily mean minimum and actual lowest temperature on the earth's surface at a few stations:—

			Mean.		Lowest.
Cue	...	...	38.7	...	27.0
Coolgardie	...	...	39.3	...	31.0
Southern Cross	...	...	37.9	...	25.1
York	...	...	38.9		
Perth Observatory	...	...	44.3	...	32.0
Katanning	...	...	33.9	...	24.0
Bridgetown	...	...	34.3	...	28.0
Karridale	...	...	41.8	...	31.0

THE CLIMATE OF WESTERN AUSTRALIA DURING AUGUST, 1901.

Locality.	Barometer (corrected and reduced to sea level).				Shade Temperature.				Average for Previous Years.				Rainfall.	
	Mean of 9 a.m. and 3 p.m. years.	High-est.	Low-est.	Aver- age for Prev- ious years.	August 1901.			Lowest Min.	Mean Max.	Mean Min.	Highest ever re- corded.	Lowest ever re- corded.	Points (100 to inch) in month.	Total points since Jan. 1.
					Mean of Month.	Highest Max.	Lowest Min.							
Wyndham	29.972	30.000	30.233	29.877	77.1	66.9	92.8	56.2	91.8	66.8	105.0	54.0	Nil	1371
Derby	30.012	30.016	30.211	29.878	70.8	54.5	93.8	45.2	88.7	60.4	102.0	48.0	Nil	1066
Broome	30.030	30.026	30.195	29.899	66.8	51.8	92.0	43.0	85.4	55.7	98.8	45.0	Nil	3187
Condon	30.056	30.052	30.272	29.908	62.8	48.0	85.0	38.0	80.1	53.7	93.0	37.0	Nil	2434
Cossack	30.087	30.048	30.307	29.931	79.4	53.4	79.9	45.8	79.2	60.3	94.0	46.0	Nil	800
Onslow	30.058	30.097	30.243	29.952	64.7	49.8	87.0	40.0	79.1	51.4	94.0	39.0	Nil	248
Carnarvon	30.106	30.096	30.262	29.973	73.0	52.1	78.8	40.5	76.7	51.9	92.0	40.0	246	797
Hamelin Pool	30.110	—	30.281	29.939	70.9	49.0	74.8	41.4	71.6	48.4	79.8	35.7	40	423
Geraldton	30.064	30.127	30.303	29.852	58.6	50.4	74.2	38.9	68.0	50.6	82.0	38.0	596	1787
Hall's Creek	30.068	—	30.342	29.827	83.9	47.8	93.0	32.8	—	—	—	—	Nil	1541
Marble Bar	—	—	—	—	82.6	50.1	90.1	41.1	—	—	—	—	Nil	1873
Nullagine	30.068	—	30.333	29.898	78.2	43.6	86.3	32.8	—	—	—	—	Nil	1824
Peak Hill	30.086	—	30.340	29.819	72.2	46.5	83.8	39.4	—	—	—	—	Nil	670
Wiluna	30.098	—	30.338	—	72.5	42.2	85.8	33.4	—	—	—	—	6	704
Cue	30.106	30.134	30.325	29.839	72.7	44.8	84.2	35.0	69.3	46.5	86.0	31.0	23	447
Yalgoo	30.100	30.133	30.340	29.843	69.5	44.5	84.8	33.0	68.1	43.9	85.3	31.5	19	422
Lawlers	30.073	—	30.337	—	57.0	58.2	85.2	33.1	—	—	—	—	18	615
Laverton	30.115	—	30.353	29.830	68.9	42.6	80.2	30.0	—	—	—	—	21	602
Menzies	30.104	30.140	30.305	29.877	67.3	44.5	81.6	35.1	65.8	45.3	83.8	31.0	50	641
Kalgoorlie	30.106	30.149	30.372	29.861	65.1	45.5	86.3	38.4	65.1	45.5	82.0	34.0	112	597
Coolgardie	30.102	—	30.363	29.897	65.1	44.3	80.6	35.6	64.9	44.2	81.0	33.0	106	550
Southern Cross	30.090	30.131	30.328	29.814	65.1	42.1	81.0	29.1	65.8	41.4	82.0	27.1	189	667

The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

THE CLIMATE OF WESTERN AUSTRALIA DURING AUGUST, 1901.—Continued.

Locality.	Barometer (corrected and reduced to sea level.)				Shade Temperature.				Average for Previous Years.				Rainfall.	
	Mean of 9 a.m. and 3 p.m.		High-est. Low-est.		August 1901.				Mean Max.	Mean Min.	Highest over re-corded.	Lowest re-corded.	Points (100 to inch) in month.	Total points since Jan. 1.
	—	—	—	—	Mean of Month.	Mean Max.	Mean Min.	Highest Max.						
Northam ..	30 112	30 118	30 365	29 804	—	64 0	42 1	74 8	62 4	41 9	78 8	29 0	239	1061
York ..	—	—	—	—	53 0	—	—	—	—	—	—	—	253	1190
Gulford ..	—	—	—	—	54 2	65 5	42 8	74 0	—	—	—	—	583	2584
Perth Gardens ..	30 101	30 112	30 363	29 846	56 6	64 7	48 4	73 0	65 5	47 1	83 5	33 6	590	3055
Perth Observatory ..	30 111	30 130	30 362	29 845	56 1	63 7	48 5	72 6	63 7	47 6	78 2	37 5	605	3133
Fremantle ..	30 086	30 084	30 309	29 832	56 8	62 6	51 1	71 0	62 9	49 6	73 8	38 0	496	2394
Rottnest ..	30 085	30 059	30 318	29 843	58 0	62 9	53 0	68 0	63 5	49 5	72 5	36 0	420	2187
Mandurah ..	—	—	—	—	52 4	63 8	40 9	75 0	—	—	—	—	491	2519
Wandering ..	—	—	—	—	—	—	—	—	—	—	—	—	444	1498
Collie ..	—	—	—	—	49 3	61 0	38 0	69 5	—	—	—	—	582	2974
Dardanup ..	—	—	—	—	—	—	—	—	—	—	—	—	584	—
Bunbury ..	30 108	30 079	30 360	29 844	54 8	63 9	45 6	75 5	62 1	46 2	73 0	33 0	619	2758
Busselton ..	—	—	—	—	53 9	62 5	45 3	70 5	—	—	—	—	565	2515
Bridgetown ..	—	—	—	—	56 0	61 1	38 9	69 0	—	—	—	—	538	2398
Karridale ..	30 081	30 091	30 366	29 784	54 7	62 2	47 3	69 0	62 0	45 5	72 0	32 5	993	3816
Cape Leeuwin ..	30 041	30 053	30 360	29 628	57 2	61 3	53 2	68 2	62 5	55 3	76 8	43 8	737	2926
Katanning ..	30 082	30 105	30 382	29 813	51 6	61 1	42 1	76 2	60 8	40 3	75 1	30 8	348	1343
Albany ..	30 088	30 047	30 393	29 711	54 6	62 4	46 8	75 0	59 7	46 6	77 5	36 0	475	1999
Breaksea ..	30 075	—	30 456	29 651	55 3	60 5	50 1	74 8	60 3	49 9	72 0	39 4	359	1524
Esperance ..	30 086	30 075	30 363	29 722	55 6	64 9	46 3	76 8	63 5	45 6	82 8	34 0	351	1899
Balladonia ..	—	—	—	—	53 4	65 2	41 5	83 0	—	—	—	—	125	446
Eyre ..	30 098	—	30 320	29 750	53 8	64 7	43 0	88 7	—	—	—	—	220	697

The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

THE OBSERVATORY, PERTH, 5th September, 1901.

W. E. COOKE. Government Astronomer.

RAINFALL for July, 1901 (completed as far as possible),
and for August, 1901 (principally from Telegraphic Reports).

STATIONS.	JULY.		AUG.		STATIONS.	JULY.		AUG.	
	No. of points. 100 equals lin.	No. of wet days.	No. of points. 100 equals lin.	No. of wet days.		No. of points. 100 equals lin.	No. of wet days.	No. of points. 100 equals lin.	No. of wet days.
EAST KIMBERLEY:					N'TH-WEST—Cont.				
Wyndham ..	Nil	..	Nil	..	Tambrey ..	Nil	..	..	..
6-Mile ..	..	..	..	..	Millstream ..	10	1	..	..
Carlton ..	..	..	..	..	Mallina ..	..	..	..	..
Denham ..	..	..	..	..	Whim Creek ..	74	5	Nil	..
Rosewood Downs ..	..	..	..	..	Cooyapooya ..	23	2	..	..
Argyle Downs ..	..	..	..	..	Woodbroke ..	..	..	..	..
Lisadell ..	..	..	..	..	Croydon ..	54	4	..	..
Turkey Creek ..	Nil	..	Nil	..	Balla Balla ..	155	7	Nil	..
Ord River ..	..	..	..	..	Roebourne ..	62	5	Nil	..
Plympton (St.M.) ..	..	..	..	..	Cossack ..	71	5	Nil	..
Hall's Creek ..	Nil	..	Nil	..	Fortescue ..	4	2	Nil	..
Flora Valley ..	..	..	..	..	Mardie ..	..	..	..	..
Ruby Creek ..	..	..	..	..	Mt. Stewart ..	..	..	..	..
Denison Downs ..	..	..	..	..	Chinginarra ..	..	..	..	..
WEST KIMBERLEY:					Peedamullah ..	..	..	..	..
Obagama ..	..	..	..	..	Onslow ..	Nil	..	Nil	..
Derby ..	13	..	Nil	..	Red Hill ..	..	..	..	..
Yeeda ..	Nil	..	..	..	Mt. Mortimer ..	..	..	..	..
Liveringa ..	Nil	..	..	..	Nanutarra ..	..	..	..	..
Mt. Anderson ..	Nil	..	..	..	Point Cloates ..	57	3	..	..
Leopold Downs ..	..	..	..	..	GASCOYNE:				
Fitzroy Crossing ..	Nil	..	Nil	..	Winning Pool ..	31	3	Nil	..
Quambun ..	7	1	..	..	Woorkadjia ..	30	1	..	..
Nookanbah ..	..	..	..	..	Mt. Augustus ..	17	2	..	..
Broome ..	22	..	Nil	..	Bangemall ..	35	2	..	..
Thangoo ..	..	..	..	..	Minnie Creek ..	62	3	..	..
La Grange Bay ..	246	3	Nil	..	Yanyearreddy ..	80	2	..	..
NORTH-WEST:					Williambury ..	58	3	..	..
Wallal ..	278	7	Nil	..	Boolathana ..	..	..	..	..
Condon ..	179	7	Nil	..	Carnarvon ..	116	..	246	..
DeGrey River ..	233	7	..	..	Dirk Hartog Is ..	268	9	133	11
Port Hedland ..	179	7	Nil	..	Mungarra ..	50	2	..	..
Boodarie ..	200	4	..	..	Clifton Downs ..	..	..	..	..
Yule River ..	..	..	..	..	Tamala ..	231	9	..	..
Warralong ..	..	..	..	..	Meedo ..	99	4	..	..
Muccan ..	274	8	..	..	Sharks Bay ..	219	3	51	5
Ettrick ..	293	7	..	..	Kararang ..	327	10	..	..
Eel Creek ..	260	6	..	..	Wooramel ..	114	3	5	2
Coongon ..	398	5	..	..	Hamelin Pool ..	180	7	40	7
Warrawagine ..	..	..	..	..	Byro ..	49	4	..	..
Bamboo Creek ..	390	6	Nil	..	Berringarra ..	35	3	..	..
Marble Bar ..	517	7	Nil	..	Mt Gould ..	36	2	..	..
Warrawoona ..	642	7	Nil	..	Peak Hill ..	71	..	Nil	..
Corunna Downs ..	415	6	..	..	Horseshoe ..	63	5	..	..
Nullagine ..	263	..	Nil	..	Abbotts ..	27	4	3	2
Yandicoogina ..	568	7	..	..	Mileura ..	49	2	..	..
Tambourah ..	..	..	Nil	..	Manfred ..	24	2	..	..
Mosquito Creek ..	53	8	..	..	Meelya ..	93	3	..	..
Woodstock ..	122	5	..	..	Woogorong ..	62	3	..	..
					Belele ..	37	2	..	..

RAINFALL.—Continued.

STATIONS.	JULY.		AUG.		STATIONS.	JULY.		AUG.	
	No. of points. 100 equals lin.	No. of wet days.	No. of points. 100 equals lin.	No. of wet days.		No. of points. 100 equals lin.	No. of wet days.	No. of points. 100 equals lin.	No. of wet days.
GASCOYNE—Cont.					S.W. Div.—Cont.				
Billabolong ..	73	3	..	..	Belvoir ..	574	11	396	11
Wooleane ..	79	3	..	..	Guildford ..	735	11	583	16
Murgoo ..	77	3	..	..	Kallyamba ..	646	11	616	13
Meka ..	107	3	11	1	Can'ing W'works	645	12	661	13
Mt. Wittenoom ..	87	3	9	1	Perth Gardens ..	801	12	590	17
Nannine ..	40	3	Nil	..	„ Observatory	860	12	605	18
Star of the East	51	4	9	1	Subiaco ..	830	11	638	16
Annean ..	..	..	..	..	Claremont ..	729	12	619	19
Tuckanarra ..	30	4	43	3	„ Richardson	708	12	539	13
Coodardy ..	..	..	..	..	Armadale ..	754	11	558	14
Cue ..	37	3	23	2	Fremantle ..	573	11	496	17
Day Dawn ..	19	2	30	2	Rottneft ..	655	12	420	17
Lake Austin ..	36	4	21	3	Rockingham ..	549	12	565	15
Lennonville ..	53	4	13	1	Canning River ..	598	10	754	16
Mt. Magnet ..	54	3	3	1	Jarrahdale ..	696	10	750	14
Challa ..	56	2	..	..	Mandurah ..	612	12	491	13
Youeragabbie ..	52	1	..	..	Pinjarrah ..	581	12	633	14
Murru ..	65	3	..	..	Harvey ..	526	13	585	19
Yaloo ..	96	..	19	..	SOUTH-WEST, CENTRAL PART (INLAND):				
Gullewa ..	107	6	77	7	Momberkine ..	205	8	..	..
SOUTH-WEST DIVISION (N'N PART):					Culham ..	195	7	322	11
Murchison House	351	8	..	..	Newcastle ..	226	8	334	12
Mt. View ..	288	8	..	..	Eumalga ..	283	7	350	14
Yuin ..	105	2	..	..	Northam ..	172	8	239	11
Northampton ..	337	8	579	13	Grass Valley ..	167	5	335	13
Mt. Erin ..	320	9	..	..	Meckering ..	117	6	350	12
Oakabella ..	342	9	613	14	Cunderdin ..	160	6	232	8
Narra Tarra ..	257	6	505	11	Doongin ..	130	6	169	11
Sand Springs ..	275	8	..	..	Whitehaven ..	174	10	221	11
Mullewa ..	156	4	218	11	Sunset Hills ..	220	8	265	14
Bootenal ..	257	7	..	..	Cobham ..	282	11	245	14
Geraldton ..	266	10	59	6	York ..	246	8	253	..
Greenough ..	538	7	708	15	Beverley ..	212	8	246	16
Dongara ..	319	6	407	11	Barrington ..	224	7	227	13
Dongara (Pearse)	278	7	401	12	Sunning Hill ..	293	10	334	9
Strawberry ..	222	7	..	..	Wandering ..	264	9	444	16
Minginev ..	230	9	511	15	Pingelly ..	239	11	222	9
Rothsay ..	..	..	..	..	Marradong ..	233	10	429	15
Field's Find ..	92	5	..	..	Bannister ..	306	9	503	19
Carnamah ..	187	7	298	10	Narrogin ..	243	10	264	13
Watheroo ..	223	9	139	10	Wickepin ..	156	9	..	..
Dandaragan ..	245	7	419	16	SOUTH-WEST DIVISION (S'N PART):				
Moora ..	245	8	239	13	Bunbury ..	621	11	619	20
Yatheroo ..	374	11	417	14	Collie ..	442	16	582	22
Walebing ..	273	11	223	16	S.A. Settlement	441	14	..	..
New Norcia ..	296	12	261	16	Glen Mervyn ..	559	11	634	21
SOUTH-WEST DIVISION, CENTRAL (COASTAL):					Dardanup ..	485	10	584	17
Gingin ..	803	11	674	15	Donnybrook ..	513	13	639	18
Mundaring ..	659	11	638	16	Boyanup ..	647	12	630	19

RAINFALL.—Continued.

STATIONS.	JULY.		AUG.		STATIONS.	JULY.		AUG.	
	No. of points, 100 equals lin.	No. of wet days.	No. of points, 100 equals lin.	No. of wet days.		No. of points, 100 equals lin.	No. of wet days.	No. of points, 100 equals lin.	No. of wet days.
SOUTH-WEST—Cont.					EASTERN DIV.—Con				
Busselton ..	628	14	565	25	Mt. Morgans ..	33	3	7	2
Quindalup ..	1026	13	589	20	Laverton ..	62	..	21	..
Margaret River ..	1198	14	638	15	Murrin Murrin ..	67	6	10	7
Lower Blackwood ..	409	11	625	20	The Granites ..	35	..	23	4
Karridale ..	763	18	993	26	Tampa ..	40	3	..	..
Augusta ..	720	13	842	20	Niagara ..	51	7	50	5
Cape Leeuwin ..	622	23	737	25	Yerilla ..	63	5	33	8
Biddellia ..	744	14	..	..	Menzies ..	44	4	50	5
The Warren ..	627	11	849	20	Mulline ..	..	..	..	..
Lake Muir ..	423	13	439	23	Waverley ..	86	6	42	5
Mordalup ..	387	13	..	..	Goongarrie ..	34	4	26	4
Deeside ..	449	10	431	18	Mulwarrie ..	75	6	33	4
Riverside ..	517	12	..	..	Kurawa ..	71	7	68	9
Balbarup ..	500	11	544	20	Dixie Gold Mine ..	53	5	68	8
Wilgarup ..	518	8	557	24	Kurnalpi ..	79	7	48	9
Mandalup ..	483	12	536	19	Bulong ..	69	7	89	9
Bridgetown ..	465	11	538	20	Kanowna ..	81	8	78	9
Greenbushes ..	508	12	657	16	Kalgoorlie ..	60	6	112	8
Williams ..	240	13	232	14	Coolgardie ..	49	6	106	..
Arthur ..	199	10	290	..	Burbanks ..	68	6	92	7
Darkan ..	226	10	..	..	Woolubar ..	40	4	..	..
Wagin ..	161	8	221	15	Widgiemooltha ..	42	7	149	11
Glencove ..	209	11	305	15	50-Mile Tank ..	54	4	113	6
Dyiliabing ..	223	9	270	13	Norseman ..	71	10	156	10
Katanning ..	172	10	348	14	Bulla Bulling ..	..	..	143	..
Kojonup ..	233	8	357	12	Woolgangie ..	53	4	748	5
Broomehill ..	215	12	216	16	Boorabbin ..	97	8	138	7
Sunnyside ..	223	12	256	18	Karalee ..	176	6	..	..
Woodyarrup ..	221	10	..	..	Southern Cross ..	108	4	189	11
Cranbrook ..	222	7	297	15	Mount Jackson ..	78	6	119	9
Blackwattle ..	232	8	..	..	Burracoppin ..	..	..	176	7
Mt. Barker ..	284	12	344	12	Kellerberrin ..	124	6	146	12
Kendenup ..	230	11	392	19	Mangowine ..	120	4	..	..
St. Werburgh's ..	261	13	..	..	Waltoning ..	..	..	..	..
Forest Hill ..	405	16	..	..	EUCLA DIVISION:				
Denmark ..	464	13	648	21	Ravensthorpe ..	120	..	367	9
Albany ..	329	15	475	20	Coonarup ..	133	8	..	..
Point King ..	393	10	528	22	Hopetoun ..	103	11	358	14
Breaksea ..	306	13	359	17	Fanny's Cove ..	86	11	..	..
Cape Riche ..	164	6	330	12	Park Farm ..	169	13	..	..
Pallinup ..	151	10	226	14	Esperance ..	231	..	351	..
Bremer Bay ..	130	12	397	14	Gibson's Soak ..	161	11	..	..
Jarramongup ..	178	9	..	..	30-Mile Condenser ..	..	..	..	..
EASTERN DIVISION:					Swan Lagoon ..	89	14	..	..
Lake Way ..	55	6	6	..	Lynburn ..	153	8	..	..
Mt. Sir Samuel ..	53	5	27	2	Grass Patch ..	89	11	..	..
Lawlers ..	40	..	18	..	Israelite Bay ..	110	13	213	11
Diotite King ..	86	7	..	..	Frazer Range ..	24	3	..	..
Sturt Meadows ..	..	..	..	..	Balladonia ..	28	..	125	..
Mt. Leonora ..	77	6	16	3	Eyre ..	92	..	220	..
Mt. Malcolm ..	61	2	4	2	Eucla ..	126	10	194	9

AUGUST, 1901.

[illegible]

9th September, 1901.

RETURN OF FRUIT TREES AND PLANTS IMPORTED INTO WESTERN AUSTRALIA DURING AUGUST, 1901.

NAME OF PORT.	No. of Ships.	No. of Consign- ments of Trees or Plants.	Total No. of Trees or Consignments.	No. of Consign- ments Passed.	Total No. of Trees or Plants in such Consignments.	No. of Consign- ments of Trees or Plants Prohibited.	Total No. of Trees or Plants in such Consignments.	No. of Packages Dipped.	No. of Trees.													All Other Trees		
									Ornamental & Pot Plants.	Almonds.	Apples.	Apricots.	Cherries.	Figs.	Lemons.	Limes.	Mulberries.	Oranges.	Peaches.	Pears.	Plums.		Small Fruits.	Vine Cuttings.
PERMANTLE ..	17	32	36513	17	36508	..	10	71	9852	9852	..	93	..	200	..	..	5600	4238	327	..	1366	11750	320
ALBANY ..	3	4	1128	3	1128	7	150	588	5	15	5	..	2	60	5	60	200	35
GERALDTON ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
HAMBLIN ..	1	1	200	1	200	..	..	1	8	..	..	..	..	..	..	..	..	..	..	..	30	..	..
BUSSELTON ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
BUNEDRY ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
ESPERANCE ..	1	1	96	1	96	..	..	2	24	..	..	..	..	..	..	..	..	..	..	..	..	..	72
TOTAL ..	22	38	37942	22	37332	..	10	81	2733	10440	6	108	5	200	2	..	5600	4238	402	CO	1760	11750	427	

DEPARTMENT OF AGRICULTURE,
9th September, 1901.



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NOTES.

MANURE.—The most abundant supplies of nitrogen occur in organic forms. The most valuable sources of organic nitrogen—from the standpoint of uniformity of composition, richness in the constituent, and availability—are dried blood, dried meat or azotine, and concentrated tankage, which are produced in slaughter establishments.

FERTILISERS FOR POTATOES.—Experiments have lately been carried on in the use of fertilisers for potato-growing at the Tennessee Experiment Station, and the results are discussed in the latest issue of the official record. They consisted of tests of the effects of fertilisers on the germination of the seeds of this crop. The best results were obtained from the use of a "complete" fertiliser, containing high percentages of nitrogen, phosphoric acid, and potash. Potatoes fertilised with a complete fertiliser averaged 2·74 per cent. higher in starch than those grown without, and 1 per cent. higher than those fertilised with nitrogen and phosphoric acid only.

FRUIT IMPORTATION.—The *Garden and Field*, in commenting on the complaints made by Tasmanian growers on the restrictions in force in this State, says:—"We have not heard any complaints about the treatment of fruit sent from Adelaide, and only one or two from Melbourne, so that it is possible the fault lies with Tasmanian shippers. Westralia has opened her port for apples from the Eastern States under certain conditions, which she made very clear. If shippers will not comply with the conditions they ought to suffer. The Westralian inspectors are fully justified in being strict when shippers will not send absolutely clean fruit at from 15s. to 17s. a case. We are afraid the lack of sense warrants the *Mail* in pitying Tasmania for being cursed with the presence of such fools—no milder word will apply."

GRAFTING.—Grafting is an art every fruit-grower should acquire. A tree of worthless fruit can be changed to something valuable. A broken tree can have scions set in its strong and healthy roots, and the tree be thus renewed sooner than by a new planting. New fruit can be tested quickly and easily. A family variety tree, with half-a-dozen sorts, can easily be arranged, while answering the purpose of as many separate trees, and will help the table out wonderfully. A tree partly or wholly girdled by mice, rabbits, or borers, can be repaired by scions connecting fresh roots or wood below with fresh wood above, and thus a pet tree or valuable variety may be saved for usefulness. By a side graft a new branch can be caused to grow to restore or create symmetry. Budding is as easy as grafting, and is a valuable accomplishment to any orchardist, and every fruit-grower should understand it.

PEACH TREE BORERS.—Some experiments conducted by Professor M. V. Slingerland, in America, have shown that gas tar has proved a practical and inexpensive remedy against peach tree borers, and that this material can be applied to trees over two years old with perfect safety. Professor Johnson, of Maryland, is also said to have used gas tar on peach trees four to six years old with perfect results. The application was made in an orchard, and only an occasional borer was found in a block of 700 trees a few months after. In an adjoining orchard about the same age the creatures were abundant, two to eight being taken from each tree. The gas tar treatment is so simple that those orchardists who have not given it a trial might experiment on a few trees at first. The best results have been obtained by applying the tar to the tree trunks early in the summer. It might be mentioned that it is not advisable to put the tar on younger trees than those above referred to.

FOOD VALUE OF FRUITS.—The Department of Agriculture has been making some investigations as to the food value of fruits, and for several years the Agricultural Departments of several States have been working along the same lines. The increased consumption of fruits has aroused interest in this matter, and the results are interesting, not so much because they show that the fruits that are most valuable as food are not worth as much as potatoes, but because we can rest satisfied, after the chemist has made his analysis, that fruits, fresh or dried, have some elements of value that escape the most exhaustive analysis. That fruits are not an inexpensive source of nutriment no one needs to be told, if we are looking for the greatest food value for the least amount of money. White bread is ten times more valuable as a support for the working man than fresh fruits, and dried beans are twice as valuable as white bread. The cold-blooded chemist would say, "Save your money and buy bread and beans," but nature tells us different. The poor mechanic will buy fruit as well as bread, meat, and beans, and he is wise in so doing, for the addition of the fruit to his diet makes the whole more palatable, refreshing, and valuable. There is much in the look of the food that we eat as well as in its chemical composition. No matter how nutritious a dish may be we do not relish it unless it looks nice and tastes nice, and fruits make an accepted garnish to a meal that would otherwise not look nice nor taste good. Besides this purely imaginary—but none the less valuable—property of fruits, there is the acknowledged medicinal value of all fruits, from the earliest rhubarb of spring to the apple that is stored for winter. The whole list of fruits is valuable for this purpose aside from any food value they possess. Any list of what to eat that seeks to save money by leaving out all fruits in their season is of no value, because it would substitute chemical analysis for a natural appetite which directs toward health and long life.—*American Cultivator*.

CURE FOR TOMATO BLIGHT.—Mr. Theodore Staley (Placentia, Orange County), writing on the above in the *Pacific Rural Press*, says :—"Last year, after losing over half my vines, I took coal tar, or gas tar, and painted on the north side—where it was less exposed to the sun—about eight or ten inches, commencing at the ground and painting one-half of the large stems, and touching in several places through the branches. The result was a perfect cure. A neighbour lost all of his vines but four and a half. I gave him some coal tar and he saved the four, and even the half vine. I had two vines on new land this year that were badly diseased when discovered. I treated them at once, and they have entirely recovered; they have grown as high as the fence, and are full of fruit. The disease is a very minute parasite, and is not bacteria. They work in the stem near the ground. The coal tar is instant death to them. The fumes may be as deadly as the tar itself.

KUS-KUS FIBRE.—The Secretary of the Department of Agriculture has just received a case of Vitiver, or Kus-kus fibre roots, imported from Ceylon. This plant, he thinks, should do well in this State. The Government Botanist, in referring to it, says :—"The fibre is composed of the roots of the grass *Adropogon muricatus*, a native of India. It is known in that country by the names of Vetiver, Vetivert, Kus-kus or Kas-kas, with variations in their spelling, all being apparently derived from the Tamul 'Vitti-ver' and the Hindoo 'Khas.' The grass is abundant on sandy banks in various parts of India, where it is cultivated for the sake of its roots, and is commonly planted to divide fields. It prefers a rich, moist soil, and grows to a height of five or six feet; it has long, narrow, rigid leaves, the flowers born on a stalk having numerous branches, the glumes (chaff) bearing minute prickles on their surfaces. The roots descend in great numbers from the underground stem, are of a yellowish-brown color, and, while not specially valued for their strength of fibre, they have a strong and agreeable aromatic odour, and a bitter aromatic taste. They are woven into the screens known as 'khas-khas tatties,' mats, covers for palanquins, awnings, fans, etc., and when such awnings and screens, suspended in a room in a hot climate, are moistened, the atmosphere is made pleasantly fresh, cool, and fragrant. While, placed among bed-clothing, they not only communicate their fragrance, but also keep off vermin from the beds. The aromatic resin in the plant is said to be acrid, stimulating, and diaphoretic, and a weak infusion of the roots is given in fevers as a cooling drink. An essence also is distilled from them, and has been used as a perfume." The plants have been distributed for cultivation, the result of which will be made known in a future issue.

For the first ten weeks of a chick's life, or until fairly well feathered, they are as delicate and as sensitive to atmospheric changes as a little baby of the same age.

CULTIVATION OF COW PEAS (*Vigna Catiang*).

BY PERCY G. WICKEN.

Although this plant is commonly called "Cow Pea" in America, it is not a pea at all, but a true bean, and the correct name is the "Catiang bean." It is now generally known as Cow Pea, and I have no doubt it will continue to be known as such in future. The plant in no way resembles a pea, but is a long-podded bean, and in both appearance and flavor takes after the bean tribe.

The accompanying illustration shows the stalk, leaves, and flowers of the plant; also the pod and a number of seeds. The pods are about nine inches to one foot long, and contain from 12 to 16 seeds.

The Cow Pea is an annual plant, indigenous to Asia and Africa, but now cultivated in most warm semi-tropical countries. It is reported to have been in cultivation in the U.S.A. for about 150 years, having been originally introduced into South Carolina, but in the last few years its use has extended very largely, and quantities of seed have been imported from China and India. Very few were cultivated in Australia, except at the experimental farms and in small areas, until about three years ago, when the Colonial Sugar Company imported a quantity of seed, which they distributed amongst the sugar cane growers, and offered to buy all the seed raised in the following season at a fixed price. Since this time the cultivation of this crop has become more general, and has given excellent results both as a fodder and a green manure wherever it has been tried.

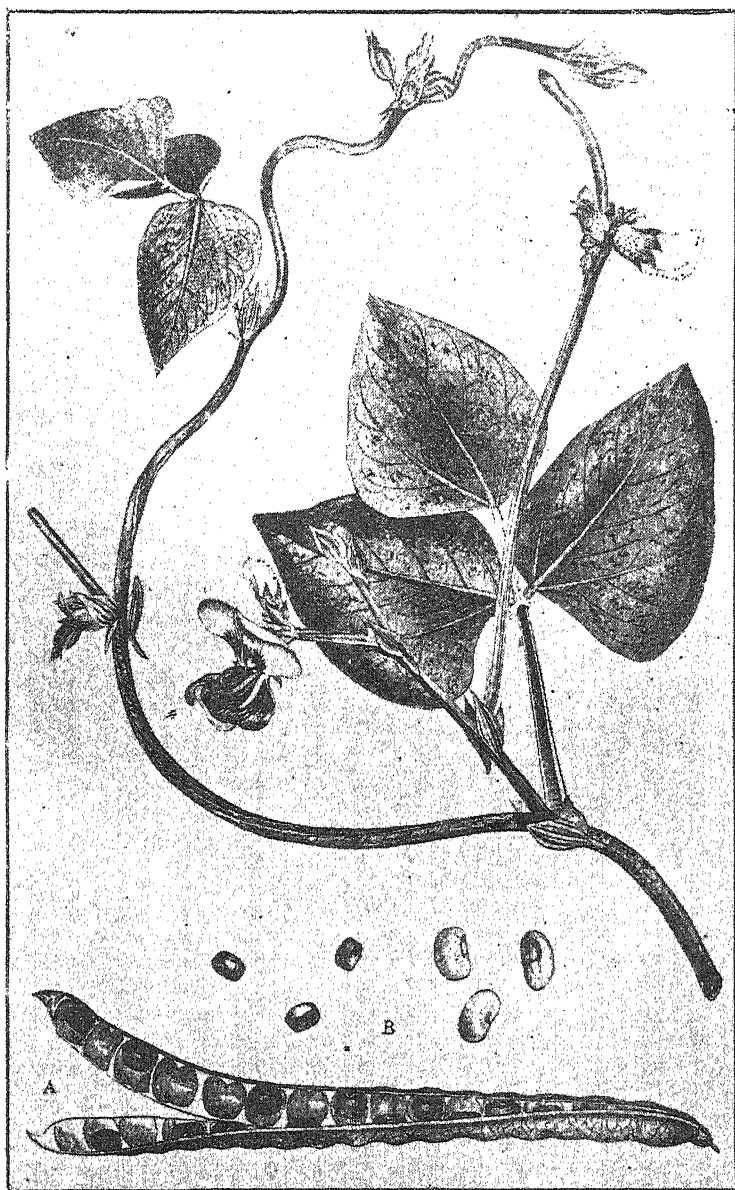
SOIL AND CLIMATE.

The Cow Pea may be said to grow well wherever the ordinary French bean will grow, although when once established it will stand very hot, dry weather. In the northern parts of the State we should be able to obtain two crops during the season, while, in the South-West portion not more than one crop could be obtained. It will grow on almost any kind of soil, but naturally gives heavier yields on a rich soil than on a poor one. If sufficient moisture is in the soil to bring the plant up and give the roots a start, it will stand a lot of heat afterwards, as the roots penetrate deeply into the soil, and obtain a supply of moisture from the sub-soil.

VARIETIES.

In the United States of America there are over one hundred named varieties of the Cow Pea grown in different parts, but in Australia so far only four varieties have been brought into general cultivation. These consist of the Black, the White, Clay-colored, and Whip-poor-Will, and are known by the color of the seeds.

The Black Variety is one of the quickest growing and most hardy varieties, is a prolific bearer, has long running vines, and gives a



Cow PEA (*Vigna catieng*, Endl.)
(From the *Agricultural Gazette of N.S.W.*)
(See page 240.)

large amount of green fodder and a heavy yield of seed. Has a black seed, with small white scar where joined to the pod.

The White Variety is not of such a vigorous growing habit as the other varieties mentioned, and is more of a bushy plant. It is the earliest maturing variety of all, and is more suitable for culinary purposes, being of good flavor, and can be used both green as a French bean, or the dried seeds can be cooked the same as haricot beans. It is not so valuable for forage, as the yield is light. There are two varieties of White Cow Pea—the large and the small. The seed is white, with a small black spot on the underneath side.

Clay-colored is, as the name implies, a reddish or clay-colored seed. The vine is of vigorous growing habit, and does well in dry weather. It yields large quantities of fodder, and from 30 to 40 bushels of seed per acre in favorable localities, and ranks next to the black in order of productiveness.

Whip-poor-Will is a brownish-colored, speckled seed variety. Is a good running vine and yields well, but does not seem to do so well as the black or clay-colored in very dry localities, but where the soil is favorable gives a very heavy yield.

PREPARATION OF LAND.

The land for growing cow pea requires to be deeply ploughed, and the surface brought to a fine tilth before planting the seed, and must contain sufficient moisture to enable the crop to germinate and to carry it on until the roots are able to obtain moisture from the sub-soil.

MANURE.

A manure containing a good quantity of phosphoric acid, potash and lime, is required. No nitrogenous manure should be applied, as it is only wasted, the plant having the power of obtaining its nitrogen from the air.

SOWING.

Cow Pea may be sown at any time after there is no further danger of frost, but no advantage is gained by sowing the crop too early, as it requires a certain amount of heat before it makes any growth. If sown too early, the young plants appear above ground and make no headway, and are then attacked by the aphids and all growth checked, and they are often unable to recover. The middle or latter end of October is quite early enough to plant the seed, and from then on to the end of January the seed may be safely sown, provided there is sufficient moisture to bring the plant up. One of the best crops I ever grew was sown at the middle of January, and yielded 45 bushels per acre. The variety was the clay-colored. Where not required for seed purposes, and there is sufficient moisture in the ground, a crop may be sown after the wheat is harvested, and will yield sufficient foliage to plough in for green manure.

The seed should be drilled in rows 3 feet apart, and about 18 inches apart in the drills, and may be sown by a corn dropper or a

"Steel Beauty" machine, which will sow two rows at a time, and mark out for the next row; or where only a small quantity is to be sown, a Planet Junior hand drill will answer the purpose. If sown at this distance apart, it will take about 9,680 seeds to the acre. This number is equal to a little over 4 lbs., and if 5 lbs. of seed per acre is sown it will be sufficient if drilled, but if sown broadcast it will require about one bushel of seed per acre on fairly good land, or more if the land is poor. The seed can be purchased in the Eastern States at the rate of about 12s. 6d. per bushel, or 3d. per lb. If the seed is sown broadcast, it can be lightly ploughed or cultivated in by means of the spring teeth cultivators, and well harrowed.

CULTIVATION.

Very little after cultivation is required by this crop. The ground will require to be kept well cultivated by means of the horse hoe and kept free of weeds until the young plants are firmly established, when they will soon take possession of the ground; fill up all the space between the rows and grow all over one another into a tangled mass of vines and smother out all weeds.

HARVESTING.

About four months from the time of sowing is the time taken before the crop is ready for harvesting for seed. The time for harvesting for seed is when the pods have turned a brown color and become thoroughly dry. The plants should then be pulled up or cut with a sickle and stacked in heaps until thoroughly dry, when they may be removed and thrashed or stacked and thrashed later on. Whenever it is possible to do so it is better to thrash the crop on the field, as, owing to the succulent nature of the haulm, if the straw is not thoroughly dried it is likely to sweat in the stack and thereby become useless.

If the crop is being cut for hay, it should be cut when the pods are fully formed but still green and succulent. After cutting the vines should be allowed to wilt for a few days on the ground before being made into heaps, and care must be taken not to make the heaps too large, otherwise they are likely to sweat, and the crop would be spoilt for the purpose of hay. Owing to the nature of the vines it takes a considerable time for the crop to become dry enough to build into a stack, and while making into hay the heap will require to be turned over every day. The vines should not be handled more than is absolutely necessary, otherwise the leaves which have become dry and brittle will crumble to dust and be lost. In stacking the hay it is advisable to stack it on a rather high straddle so as to enable the air to get underneath and circulate through the stack. If required for green manuring the crop should be ploughed under, just after they have passed the flowering stage and before the pods begin to get hard. It is often a difficult matter to plough this crop into the ground owing to the large mass of tangled vines with which the surface of the ground is covered, but this may be

got over by cutting the vines up with a disc harrow and the use of a drag chain on the plough. If a disc harrow is not to be obtained a good rolling is also a help.

YIELD.

The yield to be expected from a crop of Cow Pea may be anything from 20 to 40 bushels of grain, or 1 to 3 tons of hay, according to circumstances, condition of the ground, etc.

USES.

The green pods can be picked, and cut up and cooked the same as French beans for the table, or they can be dried and used the same as haricot or Lima beans.

The hay is much more nutritious than that made from grasses, millets, etc., and also supplies a ration of leguminous food, which we in this State are very apt to neglect in supplying our stock with their daily feed. Care should be taken not to give too large a quantity at one time, as this is liable to cause flatulence and colic.

The dry bean is an excellent feed for all kinds of stock, especially is it valuable for fattening pigs for bacon curing. But after all the greatest value is obtained by raising this crop for the purpose of ploughing in for a green manure. One thousand pounds of cow pea hay contain, according to an average of a number of American analyses, 19.5 lbs. nitrogen, 5.2 lbs. phosphoric acid, and 14.7 lbs. potash. Mr. Brunnich, the Government Agricultural Chemist in Queensland, estimates the manurial value of a crop of cow pea, ploughed in for green manure, at £5 per acre. Other chemists have given the value from £3 to £8 per acre. The value is, of course, regulated by the vigorous (or otherwise) growth of the crop—the larger the crop the greater the value, and *vice versa*.

To put this in plain words means that the farmer, by planting a crop of cow peas at a cost of (say) 2s. for seed, and a few shillings per acre for manure, and when full grown ploughing them into the soil, can add to the fertility of his soil per acre, as much of the most expensive of all manures—nitrogen—as he could purchase for as variously estimated from £3 to £8, besides which he has the benefit of adding considerably to the humus in the soil, which is of itself in most soils of great benefit.

The most profitable way to handle the crop when growing cow peas as a fertiliser is to feed the crop to stock on the ground; let them eat all they can, and then plough the resultant manure and the residue of the crop into the soil.

The feeding value of cow peas is very great, and by feeding to stock first, and then ploughing in the manure, a double advantage is gained.

CONCLUSION.

The Secretary of the Department of Agriculture is now obtaining a small quantity of the seed of each of the varieties mentioned in this article, and will be pleased to supply in small quantities to anyone who cares to make a trial of this crop.

THE INSECTIVOROUS BIRDS OF WESTERN AUSTRALIA.

BY ROBERT HALL.

MAGPIE-LARK (Mud-lark, Pe-wit).

Grallina picata, Lath. (*Gra-li'na pik'a-ta*).

Grallie, stilts; *pica*, a magpie.

Grallina australis, Gould, "Birds of Australia," fol. vol. ii., pl. 54. "Key to the Birds of Australia." Hall, p. 10 (1899).

GEOGRAPHICAL DISTRIBUTION.—The whole of Australia; accidental in 5.

KEY TO THE SPECIES.—General appearance, black and white; breast black under parts pure white; throat white in female, black in male; upper surface black; bill broader than it is high; second primary longer than the secondaries.



MAGPIE-LARK (Mud-lark, Pe-wit).

Upon the irritability, rather than the sound judgment of people, depends the extent of a war waged against birds, and it is unfortunate that a real good bird will sometimes commit, as we see

it, a theft. For a season that genus of birds must stand on guard. I know of a case in which sixty magpies (not the present species) were shot upon one field in the one week, because they were supposed to be eating grain. The justice of the action seemed doubtful and dangerous.

No such cloud has yet hung over the Magpie-lark, and is scarcely likely to, because the advance of civilisation with intense cultivation has already tried it. Rather does it become an aid with tillage expansion, especially preferring damp places, where they are needed for the subjugation of creeping things.

It is a useful species, very broadly distributed. In the North-West it is feebly represented, and less so in the central district. But from our city to most of the southern towns it is abundant. Fruit-growers and market gardeners receive very nice visits in force from this species. This so-called Mud-lark is greatly the life of the place, its "pe-wit" always announcing its approach when on the wing. The charm of the bird is best exhibited when gracefully walking by the green banks of the creek or shallow ponds, but the faery form peculiar to it is lost as the gentle creature leaves the earth for higher fields. Then its flap and heavy flight are totally different to what one would expect from its manners upon the moist ground, where its black and white plumage affords a most agreeable contrast.

Water in creeks and pools generally harbours "snails," and where the latter are very often they prove the hosts of sheep-fluke. This bird, in common with the White-fronted Heron (Blue Crane), makes war upon the mollusc hosts, and thus considerably reduce the danger and loss, especially to our western graziers.

Nest.—Cup-shaped; made of mud, and lined internally with grasses; placed near water, and generally on a horizontal bough in a eucalypt.

Eggs.—Two, three, or four to a sitting. One set may be rich, reddish brown, with markings of a stronger color; a second set may be nearly white, with brown spots upon it, varying between olive and nutty brown. Length, 0.8 inch; breadth, 0.6 inch.

SONG AND GROUND LARKS, AND THRUSHES.

There is no special reason why Larks and Thrushes should be expected to form a happy combination for review. Still there are one or two points in favor of it. Larks, as a rule, are ground-loving birds, while Thrushes are "shrub frequenting," the exception being the Ground Thrushes (*Cinclosomæ*), which keep to the ground. But they differ from the Ground-larks (Pipits) in so far as they keep to closely shrubbed ground, while the latter frequent the open. This exception might be said to bind the two—a matter of general consideration. The Song larks always soar to sing, while the Thrushes whistle sweetly under cover of some vegetation.

British people often talk of their Larks and Thrushes, and I believe every State of the King has both on the list of introductions.

I know solitary specimens have been imported into ours, and what wonder when we have such thoughts of the Larks, as Shelly has given us in his "To a Skylark":—

"Higher still and higher
From the earth thou springest
Like a cloud of fire;
The deep blue thou wingest,
And singing still dost soar, and soaring ever singest."

The Australian species is willing to follow, and is nearly able to equal the powers of the British bird. Among the larks we have three divisions:—(a) Song-larks, in two species; (b) Ground-larks (true Pipits), one species; (c) Bush-larks. Of the latter it is found they are very much seed eaters, and for that reason they will not be recognised as purely insectivorous in this work. These are all to be found in our State.

RUFIOUS SONG-LARK.

Cincloramphus rufescens, Vig. and Hors. (*Sing-klo-ram'fus ro-fes'ens*).

Kigklos, a bird; *rhamphos*, a curved beak; *rufescere*, to reddens.

Cincloramphus rufescens, Gould, "Birds of Australia," fol. vol. iii., pl. 76. "Key to the Birds of Australia." Hall, p. 29 (1899).

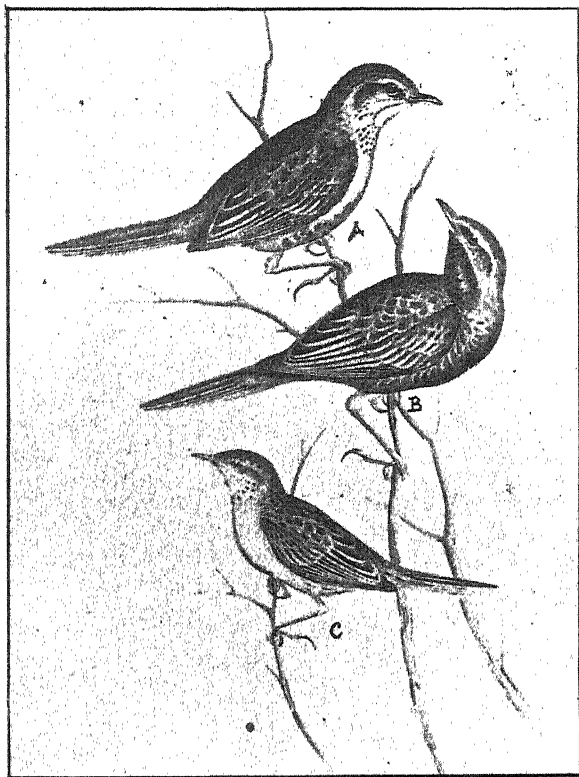
GEOGRAPHICAL DISTRIBUTION.—Australia, except Tasmania.

KEY TO THE SPECIES.—General appearance rufous-tinted; throat and abdomen whitish; upper tail coverts rufous; inner secondaries nearly equal to the primaries in length.

It will come as a surprise to many of us to know that we have Song-larks in Australia. Not only so, but strongly stationed upon the inner shores of certain parts of the eastern coasts of the Continent, is the British Song-lark, a highly favorable introduction. We might safely follow the example. Certainly our two species do not equally compare with the bird of the Fatherland, because their song, though strong, is not so rich or so prolonged. Although we generally call the *Cincloramphi* the Song-larks, there is another in many parts more worthy of the name, in my opinion. The voice is not so strong or animated, but it is decidedly a sweet one. I refer to the Bush-lark, or Pipit-like bird (*Mirastra*). While the *Cincloramphus* sings in the day, the *Mirastra* sings in the night. Mr. North says it is the only Australian bird that does so. Mr. Gilbert champions the cause of our Long-billed Reed-warbler (*Acrocephalus*).

The second species of the genus is the Brown Song-lark, a bird of more heavy build and darker plumage. The sexes differ very much in size. Both mount into the air, but it is the male that sings so enthusiastically when his mate is beneath upon the nest. It is a pleasant sight to see the tremulous mount made high into the air, and to hear the rich and voluble activity of the bird. Such a flight may be maintained for a long time, or the bird may prefer to make several voyages, coming each time to one or other tree in the vicinity of its nesting mate.

It is what we call a migratory bird, going north a few hundred miles after summer, and returning south with the early notices of spring. Mr. Gould speaks of the Swan River form of the second species (*C. cruralis*) as being slightly smaller than others. This I take as a matter of age. The leading characters are—throat and



RUFIOUS SONG-LARK.

A and B, Male in two phases. C, Female.

abdomen blackish; upper tail coverts ashy-brown. Total length, 8 inches; wing and tail, each 4 inches; tarsus, 1.5 inches.

Nest.—A small cup-shaped structure, made of grasses, and placed in a slight depression of the ground. This may be placed under living bushes or grass as a protection.

Eggs.—Clutch, three, or less, often four; pale purple-white, with spots of chestnut evenly and freely distributed over the whole surface. Length, 0.75 inch; breadth, 0.6 inch.

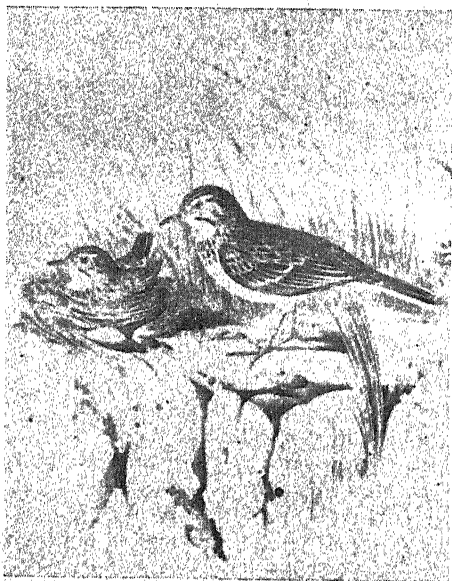
PIPIP (Ground Lark).

Anthus australis, Vig. and Hors. (*An'thus as-tra'lis*).*Anthus*, a small bird; *australis*, southern.*Anthus australis*, Gould, "Birds of Australia," fol. vol. iii., pl. 73. "Key to the Birds of Australia." Hall, p. 163 (1899).

GEOGRAPHICAL DISTRIBUTION.—Areas 9, 8, 7, 6, 5, 4, 3, 2.

KEY TO THE SPECIES.—General plumage tawny, exceedingly dark in some cases, and very light in others; outer tail feathers white, without any brown on the outer webs; second, third, fourth and fifth primaries distinctly emarginate; minor secondary quills nearly as long as the primaries; bill slender, the profile of the culmen swollen from centre to tip.

The distribution of the Pipit appears to be throughout the continent, excepting the Northern Territory. I believe it is simply a matter of opportunity to record it as found there. So common a bird is it that it is found on the highest and coldest point of



PIPIP (Ground Lark).

Australia (Mt. Cosquiasco), as well as the lowest and hottest. Our meadow Pipit scarcely needs a mention, as it has spoken for itself, I may safely say, to each of us. The larks appear to differ from the pipits in the bills of the latter being more slender and notched, as well as the hind part of the tarsus not being divided into plate-like surfaces, as with the larks, so that our familiar Ground-lark should always be honored with its more appropriate title of Pipit. The nest is invariably placed upon the ground, and the birds prefer the

same place to the air. For five minutes together you may keep the slim-footed runner moving in and out along its course, seldom essaying flight for more than a few seconds, till, finding you are intent upon annoying it, away it flaps with the wind for 100 yards or more. If it wishes to enter an adjacent field, and passes houses *en route*, it will rise quickly into the air, fly high, and fall rapidly upon the new pasture, favored with the wind. If a quarrel arises between the smallest number that can make a quarrel, a long, rapid and zig-zag flight follows, little in accord with the usual short, unventuresome flight.

The golden rule of the Pipit is to escape from danger by rapid and even running along the ground, not divulging its presence by any motion of flight. When trouble has subsided, and without any loss of time, an attack is made upon the nearest insect that is weighty enough to be of valuable consideration.

The congregation of this bird in the season when most species agree to associate is seldom more than ten to twelve in a flock upon the ground. Beyond this period the pairs, by themselves or with their young, are seen by daylight almost in any green or brown field, or heard at nightfall, when other birds are making straight for home by all the rural short cuts known to them. A direct flight of say 25 yards will occupy about five seconds, while a run in a straight line of 15 yards will take approximately the same time. Wherever a dry channel offers itself the bird will use it for escape by running, and in this way I noticed, some time ago, a young White-fronted Chat trying to evade observation and make its escape. By way of comparison both feign well an injury or youthful weakness to distract your attention from the nest of eggs or young that the parent birds have been forced to leave owing to your presence. I fear their decoy hopes are not as advantageous to them as "silence is golden" would be, for the nest would seldom be found were it not for their own aid in rising from it, and plainly saying by their action "There it is. All you have now to do is to look for it within the limited bounds prescribed for you; but, remember, the law protects me!"

The young are early models of the old. Before leaving the saucer-shaped nest of grass material the outer two rectrices are white, each with a central longitudinal dark line, and this before these feathers are an inch in length. The little birds early learn to catch the worms which appear after a heavy rainfall in such plenty, and juvenile Pipits soon find themselves doing well in business.

Associated with it in the field is a Bush or Thick-billed Lark (*Mirafra*), and so much are they alike that most of us do not know there are twin-like birds in the field. The *Mirafra* has a stout bill, and is shorter in the body. The food of the Pipit is ground-living animals, as worms and beetles (*Scarabidæ*). Recently a bush lark commonly found in the west and north-west of the State has been described as *M. Woodwindi* Mill, a tribute to the Curator of the Museum at Perth. It is rufous on most of its parts.

Nest.—Terrestrial, cup-shaped, and placed in a hollow provided for it by an introduced animal, or in a slight depression beneath a tuft of grass, and made of dry grasses; not always exposed as in the illustration.

Eggs.—Three to the clutch; brownish white, with blotches and spots varying in the intensity of brown. Length, 0.9 inch; breadth, 0.6 inch.

SORGHUM PASTURE FOR DAIRY COWS.

During the month of July the Kansas Experiment Station realised \$8.20 (£1 14s. 2d.) per acre for pasturing sorghum, besides having the field left to produce a second crop. On July 1st twenty-seven milch cows were given all the alfalfa hay they would eat and then turned into a sorghum field of 6.7 acres for 15 minutes. The sorghum was from 18 to 24 inches high. The next day they remained 30 minutes, the third day 45 minutes, and so on, increasing 15 minutes daily until they reached an hour and thirty minutes, when they were left to run at will. During this transition period the cows were given all the alfalfa hay needed to keep up the normal flow of milk. For the first nine days this amounted to nearly 24 pounds daily per head. After twelve days the cows were allowed to pasture the sorghum at night as well as during the day. For the rest of the month these cows consumed less than 5 pounds of alfalfa hay daily per herd.

If it had not been for the sorghum pasture it would have required at least 24 pounds of alfalfa hay daily per head to keep these cows up to a good flow of milk. This would have amounted to 10 tons. As it was the cows consumed only $4\frac{1}{2}$ tons, making a saving of $5\frac{1}{2}$ tons. At \$10 (£2 1s. 8d.) per ton (a low price for this year) this would amount to \$55 (£11 9s. 2d), which divided between 6.7 acres would amount to a saving in alfalfa consumed of \$8.20 (£1 14s. 2d.) per acre.

On August 1st the cows were turned into a fresh field of sorghum, from three and a half to five feet high, but with the same precautions as were exercised July 1st. This time it did not take as long to get them on full feed, and after the first week they had free access to the sorghum day and night. The two fields of sorghum are connected with each other and the cows not only have access to both fields, but in getting to the second field are obliged to pass through the first, where second growth sorghum is making a vigorous start after the recent rains. Up to present writing (August 13) the herd has not experienced the least particle of trouble from poison or even bloating.

During the time the Kansas station has been pasturing sorghum several reports have been received of cattle dying in ten or fifteen minutes from the time they entered the sorghum patch, but in every case where we have been able to get the details, the cattle have eaten the sorghum on empty or nearly empty stomachs.

Cattle should have their stomachs so well filled that they feel completely satisfied before touching the green sorghum, and then allowed to eat only a few minutes at a time until they are accustomed to it. If sorghum can be pastured successfully, as has been done by the Kansas Experiment Station, it means that the dairymen and stockmen can get an immense amount of pasture from a small area, which is available at a time when their other pastures are getting short and dry. Pasturing will also be the most economical way of utilising sorghum. The man that turns his cattle in a sorghum field, however, must realise that he may be taking risks. He must weigh the evidence for and against its use and then decide for himself whether the benefits will outweigh the risks.—D. H. OTIS, Experiment Station, Manhattan, Kansas. August 13th, 1901.

INSPECTION OF FRUIT.

The Secretary of the Department of Agriculture has received the following report from the Acting Chief Inspector, Mr. G. Buchanan:—"During the past month inspection of 909 orchards have been made in the Southern, South-Western, and Central districts of the State. The attention of the inspectors continues to be given particularly to those localities and orchards in which the San Jose scale has been discovered, and it is satisfactory to note that in the majority of cases the spread of this disease has been checked, and in some instances orchards which were formerly infested are now reported to be clean. Eighty of the orchards inspected during the period dealt with by this report were found to be free from this pest, and in the remaining twenty-one 190 trees were discovered to be slightly attacked by this scale. Of the trees affected, 13 were destroyed, and the rest are being treated by fumigating with hydrocyanic acid gas, a method of treatment which gives satisfactory results when carefully carried out. Among other diseases reported, the black scale is found to be rather plentiful in the Central and South-Western districts, while in the Southern portion of the State woolly aphis and red spider are found more frequently among the orchards. Now that the warm weather is coming on, it will be necessary for orchardists to exercise great vigilance, if they wish to combat the spread of these injurious insects. Daily inspections are made of all fruit offered for sale at the various auction rooms in the city, and frequent visits are paid to all fruit shops in the city and suburbs. The condition of the fruit exhibited for sale is generally satisfactory. The existence of fruit fly in oranges and citrons at Guildford was twice reported during the past month, and steps are being taken to have all fruit affected destroyed at once. It is to be hoped that growers will at once report the presence of this or any other disease as soon as they are aware of its existence in their neighborhood. If this were done in all cases it would greatly aid the Department in dealing promptly and effectively with outbreaks of disease in fruit-growing districts."

SOME RESULTS OF THE INTRODUCTION OF PARASITES AND PREDACEOUS INSECTS INTO CALIFORNIA.

BY GEORGE COMPERE.

California was the first State in the United States to inaugurate the system of fighting insect pests with their natural enemies, and the rewards that State has reaped from that method has been worth many million pounds sterling to it. In fact had it not been for the introduction of the natural enemies of the white cottony cushion scale (*Icerya purchasi*), the growing of citrus fruits in that State would have been abandoned years ago. As it was there were many hundreds of acres of fine bearing citrus trees totally destroyed by that scale, and thousands of acres infested by it that would also soon have been abandoned had it not been for the introduction of *Vedalia cardinalis* from Australia by Professor Albert Koebele. Notwithstanding all of the Yankee ingenuity that was displayed in the artificial methods of combating this scale its spread could not be checked. But in less than six months after the introduction of the little ladybird from this country it rid the State of that pest, and the State Board of Horticulture there found it necessary to erect breeding houses for the propagation of the scale in order to keep the ladybirds alive.

Since the discovery of *Vedalia cardinalis* Mr. Koebele discovered a second ladybird, also in Australia (*Novius koebele*), that is equally as effectual in the destruction of *Icerya* as the *Vedalia*. Another valuable enemy of this scale, an internal parasite (*Lestophonus Iceryæ*), was also discovered by Mr. Koebele in Australia and established in California. Following the above-mentioned discoveries by Mr. Koebele, the writer discovered two species of ladybirds yet unnamed in this country that are also effectual enemies of *Icerya*, and have been established in that State. Another remarkable parasite of this scale was discovered by the writer in New South Wales, being a small chalcid fly (*Ophelosia crawfordi*); this has also been successfully established in California. The writer having been requested by the State Board of Horticulture of that State not to send any more enemies of *Icerya*, as it was impossible to secure food scale enough to keep them alive there, otherwise three other species of ladybirds could have been introduced into that State from Ceylon and Java, any of which would have been able to cope with the scale and hold it in subjection.

The yellow scale (*Aspidiotus citrinus*), a very close relation of the red scale (*Aspidiotus aurantii*), was once a very serious pest of the citrus trees of California, and the tops of thousands of trees were cut off in the hopes of checking its spread, but, notwithstanding this severe treatment, its spread continued. But by the

accidental introduction of its true parasite, a small chalcid fly (*Coccophagus citrinus*), from Japan, it soon became a harmless scale, and is no longer noticed there by growers.

The brown apricot scale (*Lecanium armenicum*), once a serious pest in some districts of California, attacking the prune and plum trees as well as the apricot. This, too, was also soon brought into subjection by the introduction of its natural enemy, also a chalcid fly (*Comys fusca*); this scale is also no longer looked upon as a pest there.

San Jose scale (*Aspidiotus perniciosus*)—This scale first came into prominence in California some years ago, and derived its common name after the locality in which it first made its appearance; however it is not a native of that State, but probably indigenous to Japan. The writer, last season, while in China, found apples that were grown in the northern section of that country that were infested with scattering specimens of scale, and yet it has never been recorded as a pest from there, no doubt owing to its natural enemies keeping it in check. At one time this pest caused a great amount of damage to the growers of deciduous fruits in California, and thousands of dollars were annually expended in the spraying of infested orchards. Now this scale is no longer feared there since the State Board of Horticulture began the distribution of the little internal chalcid fly parasite (*Aphelinus fuscipennis*) to all infested sections. There are also two species of ladybirds that feed upon this scale there, the twice stabbed (*Chilocorus bivulvatus*) and the brown necked ladybird (*Rhizobius debilis*), the scale being held in complete subjection there at the present time. There are a few orchards in California at present where the scale may be found plentiful at times; this is caused, however, from the fact that the orchards in the localities where they are have to be sprayed for fungi diseases, and the strong smelling remedies used keep the parasites away. Of recent years this scale has made its appearance in a number of the Eastern States of the Union, and has caused an enormous amount of damage, and, up to very recently, the entomologists of those States placed little or no value upon California's policy of fostering and distributing beneficial insects for the suppression of noxious ones. But now, after the expenditure of large sums of money and the destruction of thousands of trees, some of the most noted professors there have begun to open their eyes, and Professor W. G. Johnson, of Maryland, read a paper before the twelfth annual meeting of the Association of Economic Entomologists in the City of New York, June, 1900. The following extract is from the paper read: "Last fall I discovered a new locality for *Aphelinus fuscipennis* near Easton, Talbot County, in an infested orchard along the Miles River. The orchard contained a miscellaneous variety of fruits, and all the trees were quite seriously infested with the 'San Jose scale.' Instructions have been given the owner to cut the trees down as soon as possible and burn them. A quantity of small branches infested with the scale was brought to the laboratory and enclosed in breeding tubes. Much to my

surprise these tubes were swarming with parasites a few days later; from one tube 1,114 specimens of *Aphelinus fuscipennis* were taken, while a second tube gave 432, a third 1,478, and a fourth more than 1,000."

The lack of knowledge of the existence of these parasites in the orchard mentioned by Professor Johnson, caused the trees to be destroyed, which if had been standing would, in a very short time, become free from the scale. When a few branches placed in four small breeding tubes produced over 4,000 parasites in a few days according to Professor Johnson's own figures, how many must the whole orchard have contained?

Black Scale (*Lecanium oleæ*). It was expected that with the introduction of the ladybird (*Rhizobus ventralis*) from Australia, by Mr. Koebele, this pest would soon have been numbered among the harmless ones there, but owing to climate conditions these expectations were only realised by a portion of the growers. In the moist sections of the State they accomplished all that was expected of them but in the dryer regions they proved a disappointment. But during the past eighteen months five species of internal parasites have been introduced into that State, which will no doubt soon bring this scale into complete subjection in all sections of the State. One species yet unnamed was discovered at the Hawaiian Islands, where it keeps this scale in such complete subjection that it is almost impossible to find any living specimens of the scale. This attacks the scale in its first stages. Another was first discovered at Brisbane. This was also a new genus and was described by Mr. W. H. Ashmead, and named *Myiocnema comperi*. This is also a parasite of the scale and destroys it before it is half grown, while the third one, also a new species, and named by Mr. Ashmead *Hemencyotus crawii*. This is a parasite upon the eggs of the scale, and its work is similar to that of *Dilophogaster californica* and was first discovered in New South Wales. Through the kindness of Professor Charles P. Lunsbury, Government Entomologist, Cape of Good Hope, two species of internal parasites were sent to California, *Aphycus lunsburyi* and *Scutellista cyanea*. These two, Mr. Lunsbury claims, keep the black scale in check in that country.

The *Thalpochares coccophagus* moth, the larva of which feeds upon the black scale in various sections of Australia, has been repeatedly sent to California, but it never has become established there. The ladybird, *Orcus australasia*, has also failed to become established there after repeated sendings.

The European cabbage butterfly, *Pieris rapæ*, which was a few years ago a serious pest to the cabbage growers of California, is now no longer looked upon as a pest there, being held in check by two parasites, one a Tachina fly, and the other a small hymenopterous parasite.

The various species of mealy bugs (*Dactylopius*), are held in check there by parasites.

A parasite of the red scale (*Aspidiotus aurantii*), was also discovered by the writer in China, and from material sent last

October, and placed in breeding jars at San Francisco, the first parasites made their appearance only about three months ago, nine months after sending. This parasite holds the red scale in complete subjection in the parts of China visited, and no doubt will do the same in California, if it once becomes established there.

The dipterous parasite (*Masiocra pachytyli*), of the plague locust have also been successfully established in California. These were secured at Corowa, N.S.W.

The Hawaiian Government a few years ago adopted California's plan of fighting the insect pests of those Islands, and employed Professor Albert Koeboele for that purpose with great success.

BALINGUP AND MULLALYUP.

REPORT BY THE HORTICULTURAL AND VITICULTURAL EXPERT.

In compliance with a request from the Balingup Farmers' Association, I visited that district last week, and gave an address on horticultural matters at the local Agricultural Hall. My remarks, which were illustrated by means of lantern slides, were listened to by some forty settlers, many of them only lately established in that part of the Blackwood.

Marked progress has of late been made in fruit-growing about Balingup and Mullalyup brooks, two tributaries of the Blackwood river. I am told there are now around these centres some 300 people on the land, and many amongst them came from the inland goldfields. All are busy clearing, planting and developing their holdings.

Foremost amongst those who are engaged in fruit-growing in that district is Mr. J. Hawter, who, within the last two years, has established on a portion of the Brooklands run one of the largest nurseries in the States, and has already 150 acres under fruit trees and in nurseries.

A great many horticultural novelties, comprising fruit trees, as well as ornamental plants, are being introduced from all parts of the world, and are planted and cultivated under Mr Hawter's personal supervision. If found to be of sufficient merit, and well-adapted to the natural conditions prevailing here, they are then propagated and distributed.

The cultivation of nuts is beginning to receive attention in the S.W. districts, and walnuts, chestnuts and hazelnuts are successfully grown, notably at the Vasse, the Warren and the Blackwood. As ornamental, as well as profitable trees, they should deserve the attention of settlers.

Apples and pears have so far received special attention at the hands of growers, while a great deal of interest is being taken by a few in the cultivation of cherries. Few localities have hitherto proved to be suitable for the fruiting of cherries in Western Australia, and the Blackwood seems to be in this respect one of the most favored. Wherever the surrounding climatic conditions prove

favorable, cherry growing is certain to prove one of the most profitable horticultural undertakings in this State. In ideal cherry districts the spring temperature is cool in the daytime and temperate at night, whereas in Western Australia it is mostly warm in the daytime and almost cold at night, the thermometer frequently registering a difference often amounting to 35 or 40 degrees between the day and night temperatures. For this reason, although the cherry trees flourish almost anywhere, and even blossom most profusely, yet they seldom properly set their fruit. In the S.W. corner of this State, where the climate is influenced by two seas, the great difference between the diurnal and the nocturnal temperatures is not so great, and the cherries planted on warm slopes often set their fruit more freely. Experience and observation should in time teach which are the most profitable varieties to grow with us, but so far cherry growing is still surrounded by too many elements of uncertainty to justify anyone planting largely and almost exclusively this early season fruit.

The smaller berries not only grow, but fruit profusely in the districts referred to. Strawberries, gooseberries, raspberries and currants are now receiving at the hands of settlers an amount of attention which had hitherto not been extended to them. Readier means of marketing, better methods of packing these perishable berries, and a larger demand for the fruit have proved an incentive to which growers have promptly responded.

The striking characteristic of these districts is that the soil is sometimes richer on the hill tops than in the valleys, and some of the best crops of cereals are often seen on the rounded undulations of the land. The hollows often require draining, and spring, as well as autumn frosts, although not severe enough to hurt most crops, at times leave their mark on the more tender plants. Altogether the opening up of the district by means of a railway and of main roads, the late development of the timber industry, and also the increasing demand for produce of all kinds have all combined to extend settlement in a very promising district of this State.

THE NEW MILK STANDARD.

The new milk standard adopted by the Board of Agriculture came into force on September 1st. The regulations state that when a sample of milk (not being sold as skimmed, or separated, or condensed milk), contains less than 3 per cent. of milk-fat, or 8.5 per cent. of milk-solids, other than milk-fat, it will be presumed, for the purposes of the Sale of Food and Drugs Act, 1875 to 1899, until the contrary is proved, that the milk is not genuine. Where a sample of skimmed or separated milk (not being condensed milk), contains less than 9 per cent. of milk-solids, it will be regarded as not genuine.

AUSTRALIAN FRUIT CASES.

By A. DESPEISSIS.

Much confusion exists as regards the size and shape of fruit cases in the various fruit growing countries, and perhaps, more so in Australia, where, amongst others, the following cases are used.

No. 1, called the "*Half-Case*," is used both for oranges and lemons chiefly in Victoria and New South Wales. The sides consist of battens nailed down with intervals of $\frac{3}{8}$ to $\frac{1}{2}$ inch between. Unless the fruit has been sweated and is properly cured these cases are apt to bruise them and thus favor decay. Outside measurement, 2,310 cubic inches; inside measurement, 1,856 cubic inches, or 362 cubic inches short of a bushel; number of cases to 1 ton shipping measurement of 40 cubic feet: 25 cases; weighs $8\frac{1}{2}$ lbs. when made of deal.

No. 2. *The new Tasmanian and Victorian Apple case*.—Battens broader and nailed down close together. Outside measurement, 3,000 cubic inches; inside measurement, 2,300 cubic inches; number of cases to 1 ton ship measurement: 23 cases. These cases only have four corners, and for that reason are easier to pack. Weighs about 10lbs. when made of oregon deal, and can be packed crosswise like bricks, without waste of space. The subdivisions are 10 x $7\frac{1}{2}$ x 20in. and 10 x $3\frac{3}{4}$ x 20in. both with a central $\frac{1}{2}$ in. division.

No. 3. *Tasmanian Apple Case*.—Outside measurement, 3,064 cubic inches; cubical contents, 2,457 cubic inches; number of cases to 1 ton ship measurement: 22 cases. Weighs about $13\frac{1}{2}$ lbs. made of deal.

No. 4. *South Australian Export Case*, for apples and pears. Outside measurement, 2,757 cubic inches; cubical contents, 2,208 cubic inches, or practically a bushel; number of cases to 1 ton ship measurement: 21 cases. Weighs $8\frac{1}{2}$ lbs. made of deal.

No 5. *South Australian Apple and Orange Case*.—Outside measurement, 3,269 cubic inches; cubical contents, 2,496 cubic inches; number of cases to 1 ton ship measurement: 20 cases. Weighs about 10 lbs. made of oregon. The figure shows at each end on one side of this case two narrow battens $\frac{1}{4}$ inch thick, which prevent the cases lying closely together when stacked and thus promote ventilation through the heap of cases.

No. 6. *Sydney Dump*, or local market case, for oranges and passion fruit. Outside measurement, 3,493 cubic inches; cubical contents, 2,864 cubic inches; number of cases to 1 ton ship measurement: 20 cases. This case is also known as the "*Gin Case*." It is strongly constructed and is supplied with triangular battens at each corner, and is also provided with a lid fastened by means of leather hinges. This case weighs about $13\frac{1}{2}$ lbs. when made of oregon deal.

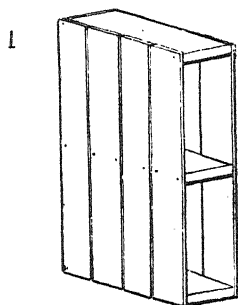
As the contents of the case vary, so do also the weight of the several fruit. Apples for instance weigh on an average 40lbs. per bushel of 2,218 cubic inches, and good keeping apples up to 42lbs.; Pears, Peaches, Nectarines and Apricots, 4 to 6lbs. more or 44 to

46lbs. per Imperial bushel ; Plums, 16 to 20lbs. more or 56 to 60 lbs.

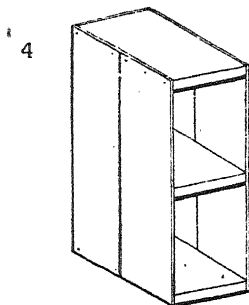
These fruit cases are made of sawn deal $\frac{1}{4}$ in. thick, with end boards and centre boards $\frac{3}{4}$ to $\frac{7}{8}$ inch in thickness. They are stronger than the thin cases hitherto used in America, and for that reason stand handling better and afford better protection to the fruit when slung into the shiphold or out of it.

At the Intercolonial Fruit-grower's Conference held in Brisbane in June, 1897, an attempt was made to arrive at an understanding concerning an uniform Australian fruit-case, and the case figured No. 2 found favor. Mr. Peacock, of Tasmania, who designed it, claims that by its use a saving of 6d. per case is effected in freight charges, etc., over the old style of flat packages. It is constructed of $\frac{3}{8}$ in. stuff for the sides, tops, and bottoms, and $\frac{3}{4}$ in. for the ends. No centre division is used. The main disadvantages of this case are that it too closely resembles a kerosene case and that some growers might either inadvertently or, when short of the proper packages call into requisition such cases and thus expose the consumer to purchase fruit flavored with kerosene. It is besides somewhat large for such fruit as pears shipped to long distances, when the heating of the contents often spoil much fruit. Another disadvantage is that the timber would require to be specially cut, as the widths (7in. and 9in.) are not sizes usually stocked, and this would for that reason preclude the use of boards from old cases or from the waste from ordinary boarding found at saw mills.

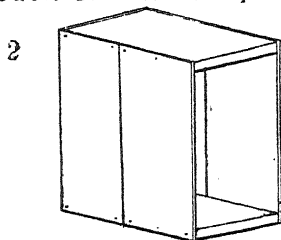
Since then Mr. G. H. Grapes, of Wellington, New Zealand, at a Conference of the Auckland Fruitgrowers' Union, urged the claim of a bi-cubic shaped case. The ideal shaped package for fruit is one of cubic form, the fruit being thus, whichever way the package stands, always subject to the same pressure. Bearing this principle in mind, Mr. Grapes suggests the use of "a case consisting of two cubes each 11 x 11 x 11 inches inside measurement, with a total capacity of 2,662 cubic inches, the external dimensions of which would be 12 x 12 x 24 inches, and would stack in any manner exactly 20 to the shipping ton of 40 cubic feet; such case to be provided with a central division of $\frac{1}{2}$ -inch, ends $\frac{3}{4}$ -inch, and sides of $\frac{1}{2}$ -inch timber or thinner. The subdivision of the same to be 11 x $5\frac{1}{2}$ x $22\frac{1}{2}$ inches, capacity 1,331 cubic inches; and 11 x $2\frac{3}{4}$ x 22 inches, capacity 665 cubic inches; both with a central $\frac{1}{2}$ -inch division. In the full-sized case this bi-cubic form would minimise heating and bruising of fruit consequent on one or more fruit decaying thereby loosening packing. Laid down in any way, the bottom layer of apples or oranges would have to bear only 8 or 9 inches of fruit pressure, as against a possible 15 inches in Tasmanian, and 17 inches in Californian cases. Whichever side were opened would display a broad array of fruit, only one breadth of stuff (11 inches) need be used, which could be cut from waste, effecting a saving in quality of timber and in the time required in manipulating lesser widths, also in nails and time consumed driving; further, in time and material taken in making the three additional cases required to



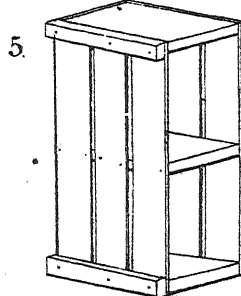
$27\frac{1}{2} \times 14 \times 6$
Cubic Contents 1.856 $\frac{1}{2}$ Inches



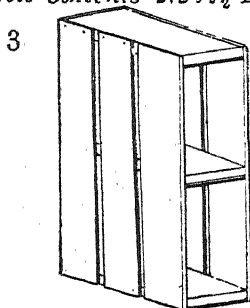
$24\frac{3}{4} \times 12\frac{3}{4} \times 8\frac{3}{4}$
Cubic Contents 2.208 Inches



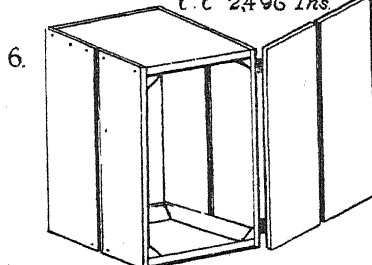
$20 \times 15 \times 10$
Cubic Contents 2.299 $\frac{1}{2}$ Inches



$28 \times 12\frac{3}{4} \times 8\frac{3}{4}$
C.C. 2.496 Ins



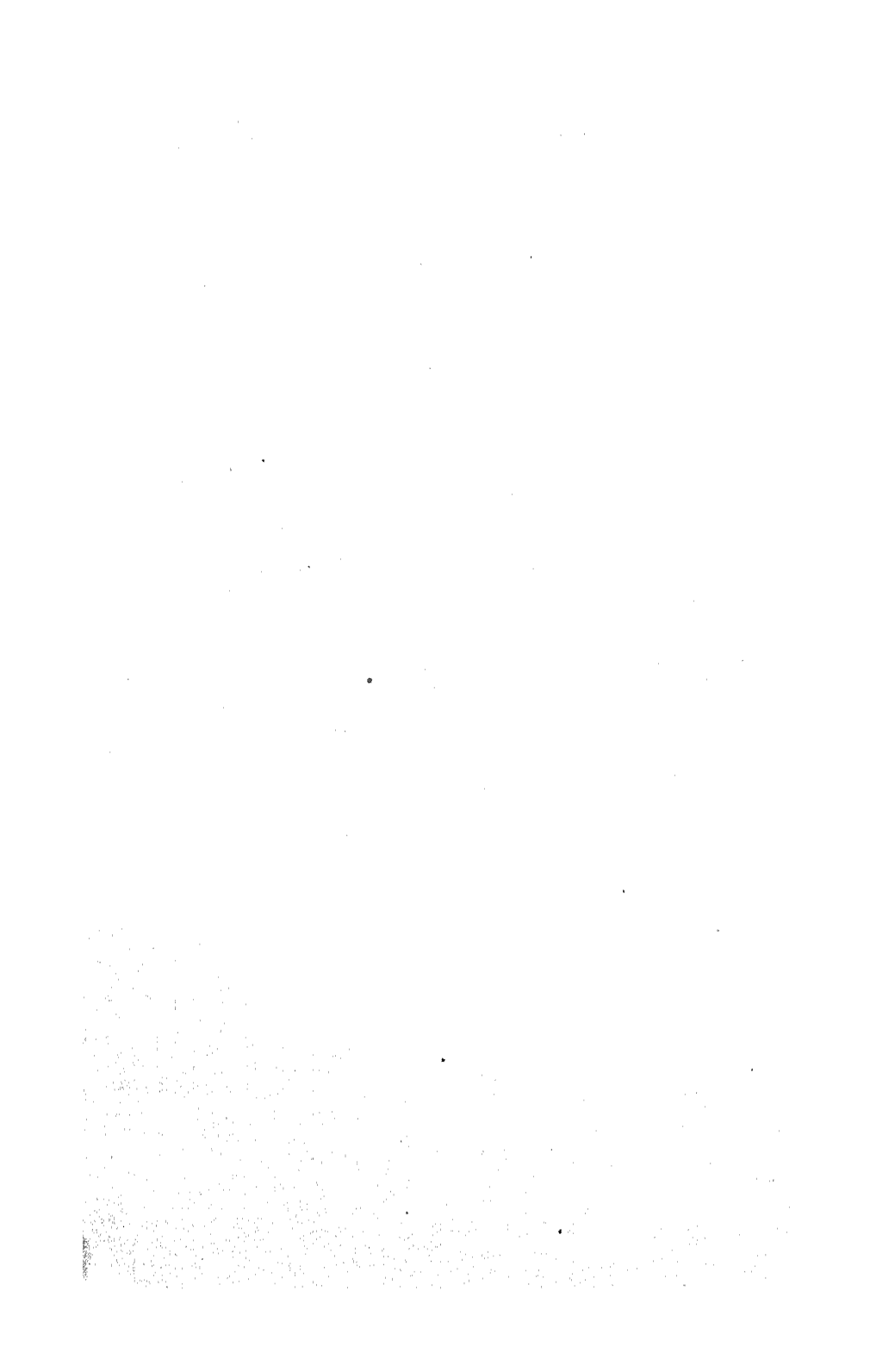
$28\frac{1}{2} \times 14\frac{1}{2} \times 7\frac{1}{2}$
Cubic Contents 2.457 Inches



$22\frac{1}{2} \times 13\frac{1}{2} \times 11\frac{1}{2}$
Cubic Contents 2.864 Inches

The cases shown are drawn to scale from cases containing fruit imported from the several Australian States.

(See page 259).



hold a ton of fruit according to Tasmanian dimensions. If necessary $5\frac{1}{2}$ inch wide timber could be used in making both full and half size cases, the ends of the full-sized cases being held together by metallic dowells."

Mr. Grapes also suggests turning the central division with the grain of wood at right angles with the grain of the end pieces, thus absolutely preventing the splitting of packages by rough handling and spilling the contents.

The depth of the half-case ($5\frac{1}{2}$ inches) closely approaches the depth ($5\frac{3}{8}$ inches) of the Californian fresh peach, plum, and apricot package, and their grape case of 5 inches in depth. The depth of the quarter-case of $12\frac{3}{4}$ inches varies but $\frac{1}{4}$ inch from the standard Californian cherry box, with a depth of 3 inches, and would be found very suitable for packing the more tender berries.

Whatever shape of package is used the cases should be clean, and neatly branded at one end with the name of the fruit, the grower's address, the weight or the number of fruits the case contains.

Experiments have been arranged by this Department to test the value of she-oak (*Casuarina*) and other suitable local timber for case making, and it is thus hoped that the cost of fruit packages to the growers may thus be reduced. Several of our most enterprising growers have already tested red gum and other timber, but as a rule these cases have been found heavier than deal, more easily split when driving nails, and it is not yet demonstrated whether they will stand slinging and rough usage as does the softer and more yielding deal.

AN INTERESTING SALTBUUSH EXPERIMENT.

Some months ago the Department of Agriculture received a communication from Mr. F. Kitching, Inspector of Permanent Ways at Tongku (Northern China), in which it was stated that there were large barren plains in that portion of the country, and in the hot weather the surface formed into a very fine dust. The wind caused this to drift to such an extent as to render traffic unsafe. Mr. Kitching, who wrote on behalf of the Imperial Chinese railways, thought the difficulty might be overcome by securing some plants that would thrive in the soil and prevent drift. He, therefore, requested the Department, in the event of their having what they considered would overcome or lessen the difficulty, to forward the seeds. The Department sent a parcel of saltbush seed, and now are in receipt of a letter stating that half of the parcel had been planted as an experiment. Saltbush thrives in the barren desert country of the interior of Australia, and the officers of the Agricultural Department are waiting with interest for a further communication from Mr. Kitching, giving details of the result of the experimental planting in a place which has the two extremes—heat and cold. In Northern China the mercury often ascends as high as 105 degrees in the summer months, while in winter it frequently falls below zero.

ANGORA GOATS.

BY REX. N. BLAXLAND, MURINBIN, BROKE, N.S.W., IN N.S.W.
Agricultural Gazette.

The goat has accompanied civilisation into all parts of the world—not numerous, but persistently. He is everywhere, and is well known. There are very few people who have not seen a goat, and there are fewer still, no doubt, who have seen many goats. The comic writers, playing upon his peculiar habits, have brought him into disrepute, although these habits to a large extent are such as are recommending him for special favor at the present time. His fame is well known as a denizen of vacant lots and back alleys, subsisting upon anything or nothing. A keen observer in Sydney might have noticed that a speciality of his is the “tasty” gummed poster on the advertising hoarding, though he does not despise any remnants of newspapers; indeed, he might be aptly described as the scavenger of the dust-box, and foe to everything. So much for the town goat, but the variety I propose to discuss in these notes is a very different animal of commercial importance.

AUSTRALIAN PROSPECTS.

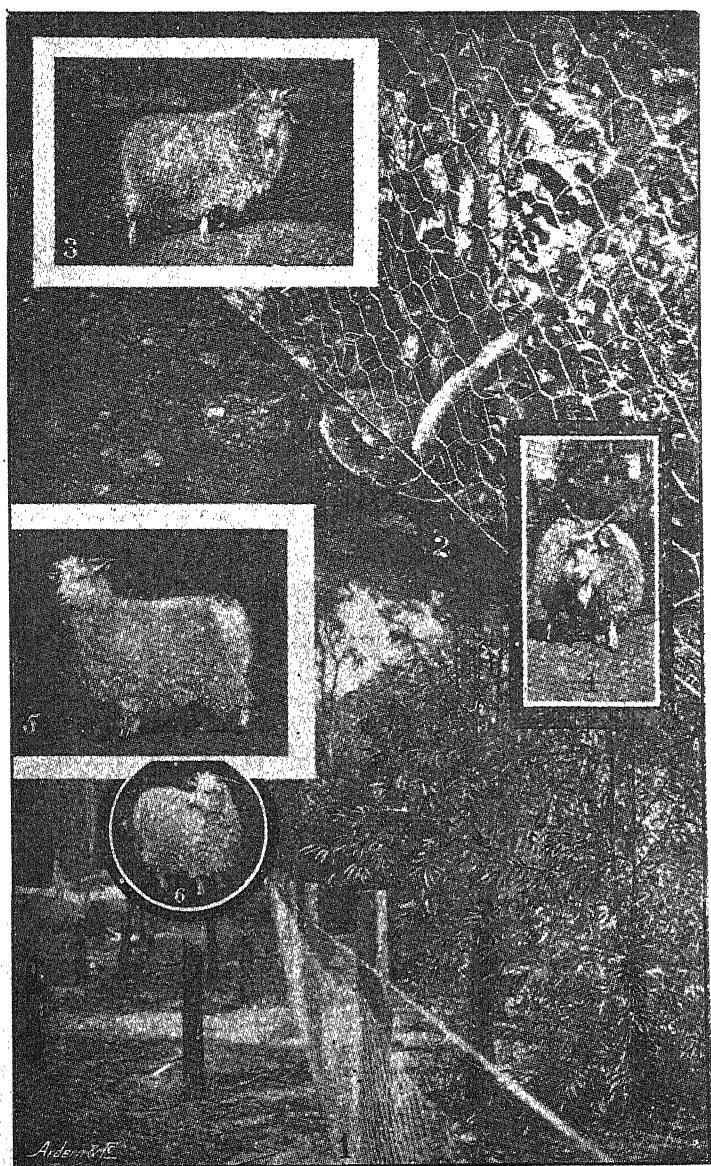
The progress of the Mohair Industry, at its inception both in South Africa and the United States of America, has been, by slow degrees, due in a large measure to the high cost of obtaining the original stock from the Turks in Asia Minor, and to the prejudices of stock breeders against all classes of goats. Although it is instructive and interesting to note the success of Angoras in these two countries, it is of far greater practical interest to Australians to dwell on the natural facilities which we possess, and to try and discover the lines on which the industry can be successfully developed here.

It appears that a *sine qua non* with the Angora is dryness of climate: given dryness, they have been proved to do well in extremes of hot and cold, but they will not stand wet and cold combined, more especially after shearing; and in those districts where this class of weather is experienced, it would be necessary to build shelter sheds for protection. Over the greater area of our vast island continent, we can emphatically claim the possession of a “dry” climate, a feature which protracted droughts of the past few years have impressed indelibly on the minds of all connected with our greatest national industry. Here, then, we may claim to hold one essential to the satisfactory establishment of Angoras.

The next factor to determine is whether the class of food we have to offer the Angoras will be such as to enable them to thrive and fatten, and grow a good quality of mohair.

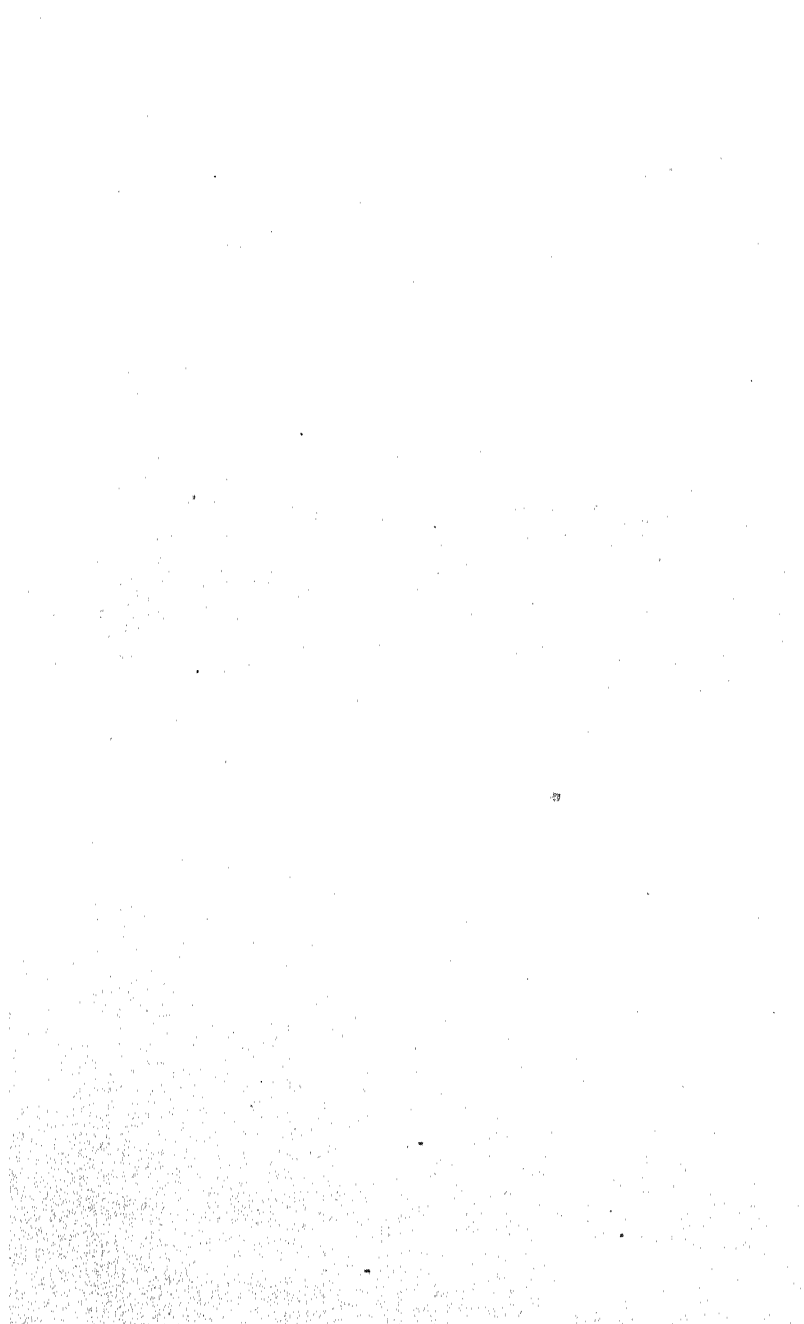
The accompanying illustrations (page 265), showing the manner in which the goats have dealt with the scrub at Murinbin, afford a striking and practical answer to this question.

The order of their food appears to be in inverse ratio to that of sheep, horses and cattle, as the Angora prefers shrubs, weeds, and



ANGORAS AT MURINBIN.

1. To the left of fence—inside goat paddock; to the right of fence—outside goat paddock.
 2. Stump—left of fence, inside goat paddock: right of fence, outside goat paddock. 3. Special stud buck, "Senator." 4. Special stud buck, "Commonwealth." 5. Special stud nannie, "The Runaway Girl." 6. Special stud nannie, "Mimosa."
 (See page 254.)



other rubbish before grasses, while sheep and cattle naturally eat grass first, and shrubs, etc., when forced to by the absence of grass and the pangs of hunger.

Angoras readily adapt themselves to the surrounding conditions. They breed once a year, and increase rapidly, the average percentage being reckoned from 80 per cent. to 110 per cent. An American breeder speaks of them as follows :—

“ They are a very hardy animal, having lots of sense, are good rustlers, and will not starve if there is anything in the neighbourhood to eat. They seem just as happy gnawing the bark off a dog-wood sapling as barking your choicest apple tree. They feed in flocks, and do not scatter over the pasture like sheep. When alarmed, they will bunch together to defend themselves. They are browsers, not grazers, and prefer weeds and brush to grass. They eat the leaves off every tree and bush that grows in Kansas, and, not content with the leaves, they want the bark also. They eat every weed that grows that I know of, except mullein and burdock. They seem ‘ticked to death’ when they strike a patch of jimson-weed. They are perfectly happy in a bunch of smart-weed. They watch and patiently wait for the thistle to put forth its bloom, so that they can enjoy that rare morsel. Buckbrush, which is destroying so many of our fine pastures, is their delight; in fact, goats are ideal brush exterminators; they do it at a cash profit instead of a costly outlay. One writer speaks of them as ‘picking gold off the bushes.’ ”

The advance of the industry in Australia cannot be otherwise than gradual, owing to the limited amount of pure stock available, but the extension of the industry will have to be on similar lines to those which have proved so eminently successful in South Africa and the United States, viz., by carefully cross-breeding up flocks from the common goat, of which there are ample supplies available in the various States, and especially so in the case of Queensland. But there is no reason why the industry should not go rapidly ahead when once it gets a footing in Australia, as the difficulties of obtaining stock from foreign parts are now reduced to a minimum by the transport facilities which modern ships afford; and as to the prejudices, the practical success which has been accomplished in the above-mentioned countries should effectually remove them. Amongst the sheep-raising countries of the world Australia takes pride of place with the success she has achieved with the merino, and the example of such an achievement will, no doubt, stimulate her to make similar efforts to obtain first place in the production of mohair. There is no doubt when once stockbreeders realise that, with the Angora, they can clear land smothered with the redoubtable and often despised gum at a profit, instead of sinking a further ten to fifteen shillings per acre in it, the future of the Angora in Australia will be assured.

They should, indeed, prove the salvation of this class of land,

for to improve its carrying capacity for sheep by clearing, ring-barking, etc., means, in all probability, the raising of its capital value to a point where a reasonable return for the capital invested cannot be expected.

The present time is, undoubtedly, an opportune one for Australia to launch out, as, owing to the war in South Africa, the progress of the Cape industry has received a material check. How long it will take them to pick up the lost ground it is impossible to say, but the effect of the reduction of supplies of mohair at the world's largest source of production affords an exceptional chance for Australia to push the business in its initial stages.

The following is taken from an exchange: "Now that so many correspondents of the *Sydney Mail* are making enquiries about the Angora goat and its adaptability to different districts in this State, it may prove interesting to give the most recent account of the mohair industry. Readers have already had several opportunities of learning about the habits of this goat and its principal characteristics, as well as the rich gamey flavour of the meat, derived from its browsing habits, which impart to the flesh a venison flavour. By the latest American mail I noticed in the *American Sheepbreeder* a letter on mohair from, as stated, the largest users of this article in the States. From it I gather the following:—A fine lustrous fleece of a fine long staple is considered the perfection of mohair. Short mohair is practically worthless. 'It is a pity, they say, so many raisers clip their herds twice a year. Mohair is very difficult to spin and short mohair goes terribly to waste; consequently does not bring a good price. If it must be clipped twice a year, let one growth be fully eight months regardless of the shortness of the four months' clip, and it will bring a much better average price. Dress goods as a rule require fine mohair. Cloakings in some years are made of coarse, bright mohair. Unfortunately the coarser grades are coming to the front out of proportion. Coarse mohair is seldom worth over 11d. per lb., short mohair we do not care to buy even at 5d. per lb. We are in a position to state that American mohair can be raised equal to the best Turkey product.' For clips of fine hair 19d. to 20d. have been paid even at present low prices, and in one instance 22½d. was paid for a carefully grown clip. When the clip is sent to market the bales are opened, and a report is made on the percentage of fine, medium, coarse and short, with items as to condition, breed, and cleanliness. From this it would appear that as yet little or no classification is done by the grower. These American opinions plainly show that should mohair be grown in the waste scrubby lands of the western division of this State, growers could not reasonably expect high prices for the product. I fancy that in such districts as Parkes, Condobolin, Molong, Cowra and Young, this goat can be profitably bred. However, the attempt should at first be made on a small scale, since it has to be proved whether it can return the owner a larger profit than the sheep.

THE CODLIN MOTH ABROAD.

A. DESPEISSIS.

There are still people who believe or state that the codlin moth is, and has, for a long time, existed in Western Australia. Others declare that the statement is malicious, and has at different times been spread by people interested in seeing removed the ban under which the moth and its hosts, the apple, the pear, and the quince, laboured until lately. Whether the first are correct in their assertion, or the second in the motives they cast on their assailants, the fact remains that, even to this date, no authentic case of a codlin moth having been captured in a West Australian orchard has yet been recorded, and, so far as we know, the statement that the insect has been observed in fruit grown in this State is not founded on facts.

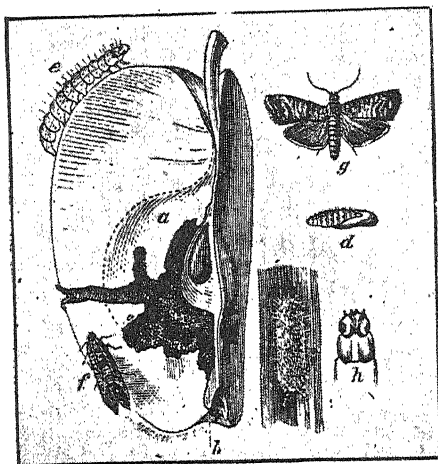
As the question of the possible introduction of this pest has now become a topic of conversation which is warmly taken up by orchardists all over the State, I have carefully gone through the published experiences of well-known observers, both in the Eastern States and in America, and have sifted from the mass of information thus gathered, much that may be of use in imparting to apple-growers a knowledge of the habits and the peculiarities of the codlin moth. One of the latest exhaustive reports on this orchard pest is contributed by Mr. A. M. Lea, once Entomologist to this Department, and now Government Entomologist of Tasmania.

Apple culture is recognised as a national industry in Tasmania, and Mr. Lea has devoted himself with all the earnestness that the question demands in dealing with his subject. From that report I shall cull much of the up-to-date information concerning the habits of the codlin moth in Australia.

Just as in the course of a few years the oïdium of the vine swept vine-growing out of existence in Madeira, and then threatened the vineyards of the world, just, also, as the dreaded phylloxera for a time devastated the vineyards of France, so the codlin moth has of late inflicted incalculable loss to Australian orchardists. As patient and laborious observation have thrown light on the mysterious spread of the two scourges of the vine-growers, and led to their being kept in check, so it is not unreasonable to predict that a better understanding of the habits and behaviour of the codlin moth may some day lead to methods which will check its spread. Since light has been thrown on the habits of the codlin moth, it becomes more apparent that instead of raising barriers against its dissemination over the Australian fruit-growing areas, our fruit and produce marketing methods have offered every facility for its distribution, even to the most isolated and the most distant orchards.

DESCRIPTION.

The codlin moth (*Carpocapsa pomonella*, Linn). It is so called because in Europe it mostly attacks the early culinary or "coddling" varieties.



a Piece of an apple, showing the work of the larva. b Point of entrance of the larva. d Pupa. e Larva or caterpillar. f g Imago or moth. h Head of larva, enlarged. i Cocoon.

spaces, says Lea, are due to hairs, and are absent in the females.

The *egg* is white, scale-like, and flat. Smaller than the head of a pin it is not easily seen on the fruit until the young grub has left it, when it soon after falls or is blown off.

The *larva*, or grub, on hatching is one-sixteenth of an inch in length, and, when full grown, ten times as large, or five-eighths of an inch. It is of a fleshy pink colour and is covered with a few stiff hairs. The male, says Lea, can be distinguished from the female by the presence of a small dark space in the centre of the body, that can be seen through the skin. (The grub of the light brown, or false codlin moth (*Cacavia*) is chiefly differentiated by its dirty green colour, besides being considerably thinner.)

The *pupa*, or chrysalis, is brown, and about half an inch in length; when empty it is a very pale brown.

The *cocoon* is made of white silk, and is joined to, and more or less concealed by, the bark or bandage, wherever it is placed; it is never loosely placed, and frequently the grub eats a small hollow space for its reception. I have often seen these cocoons between the nailed end of the battens, and the end or centre board of fruit cases, in places where one could hardly insert the blade of a knife, the grub having practically eaten for itself a hollow chamber where it spins its cocoon.

INTRODUCTION AND DISTRIBUTION.

The codlin moth is as widely distributed as the apple itself. It is a native of Europe, where, owing to the fact that it is there kept in check by climatic conditions, or by natural enemies, it is not so mischievous as it has proved to be either in America or in Australia. It was introduced into the United States, from Europe, soon after the first settlements were founded. In 1874, or a little over a hundred years ago, it appeared in California, and is supposed to have been brought in old fruit boxes. It appears to have been introduced into Australia from California, and was first recorded from Tasmania, forty years ago, in 1861. During that time it has ruined many a fruit-grower, and now levies a most galling tax on most apple-growers in the Eastern States of Australia, as well as New Zealand and Tasmania.

This pest does not attack apples exclusively, but it is also found, although not so commonly, in pears and in quinces. When driven to it the moth also turns its attention to hard-flesh plums, peaches and apricots. It has been seen (but very rarely) on the cherry and walnut; although reported in the tomato, the grubs have in every instance proved to be the well-known pests of that fruit, the *Heliothis armigera*, or *Mamestra composita*, whose grubs are much larger than that of the codlin moth.

In Bulletin 142, Cornell University Experiment Station, on the Codlin Moth, 1898, by M. V. Slingerland, the following estimation of the amount of damage done by the moth occurs:—“Conservative estimates put the annual loss from its ravages, in all countries where it is noticeably destructive and but little is done to check it, at from 25 to 75 per cent. of the crop of apples. Where modern methods of combatting the insect are practised this percentage is often reduced one-half or more.”

The same author estimates that the loss due to the codlin moth was:—

1887—State of Illinois, 2,375,000 dollars (£475,000), or one-half the value of the average apple crop.

1892—Nebraska lost 2,000,000 dollars of apples (£400,000).

1898—New York County, 3,000,000 dollars (£600,000).

Lea, in 1900, estimated the loss annually caused in Tasmania by the codlin moth at £30,000, “this, however, is probably far below the mark.”

“A loss in an orchard of 50 per cent. is by no means uncommon, and I have myself (says Mr. Lea) seen an orchard near Launceston every apple in which was struck, and many of which contained two, three, or four grubs. From an orchard near Hobart as many as 11,000 infested apples have been picked to the acre.” At five apples per pound this would give 2,200 lbs., and at 40 lbs. of apples to the case, 55 cases of grubby apples per acre.

Western Australia, as already stated, is not yet known to be infested with the codlin moth, and this is entirely due to its comparative isolation, and to the wise legislation introduced twelve

years ago, and prior to the introduction of Responsible Government. The measure, an Order-in-Council, under date 7th March, 1889, absolutely prohibited the importation of apples, pears, and quinces on any point of the West Australian coast south of Champion Bay and the port of Geraldton. The late Bureau of Agriculture has often been given credit, or has been abused, for this wise piece of legislation, but it is seen that the Order-in-Council was enacted some five years before the Bureau was constituted.

On the 5th of July, 1901, another Order-in-Council revoked this order, and since then the prohibition of apples, pears, and quinces has been removed.

LIFE HISTORY IN AUSTRALIA.

Apple trees blossom in Australia from the last week in September to the end of October, and a week or two after the opening of the petals the first codlin moths issue from the pupæ or chrysalis, and the males and females mate. The proportion of these is fairly balanced. From observations made, the female lays 80 odd eggs. The mother moth flies about at dusk, or even earlier in the day if the weather is cloudy, and lays one egg on each apple (if more than one grub is found in the fruit then the eggs have been laid by different moths); that egg is more frequently deposited about the eye, but it is sometimes seen on the stalk, or even on leaves.

The eggs are sometimes infertile, especially in cool, foggy localities, where the parent moths either fail to mate or on account of the egg not having sufficient warmth to hatch. The first theory is the more likely under Australian conditions. During the egg-depositing period the moths are said to fly long distances in search of a suitable place to lay their eggs, and are often carried in the direction of the prevailing wind.

The eggs hatch in from seven to ten days, and the young grubs grope about nibbling at the fruit, generally about the eye where they have their first few meals. Shortly after they strike the apple and effect an entrance into the fruit, generally in the eye, but at times from the side or at the place where two apples touch, or where a leaf is resting on the fruit. Once the fruit is struck the young grub goes on tunnelling towards the core of the fruit, coming back to the entrance to void its castings, and afterwards leaving them in the tunnel. It soon reaches the pips, one or more of which it eats, and then, in about a month's time, when full fed, it carves a tunnel out for itself, generally on the side of the fruit, but sometimes, although rarely, along the same channel it cut when entering into the apple. This channel is not always visible from outside, but when the apple is cut into often becomes noticeable.

When full fed it either comes down with the fruit which drops prematurely, or it lets itself down by means of a silky thread, and it then proceeds to seek shelter. This it finds in most cases under loose bark on the trunk or the main limbs of the tree itself or on adjoining trees, or on fencing posts, under heaps of rubbish, among

empty cases, potato bags, or other packages, in the cracks of adjoining buildings, in piles of rubbish, or under dry clods; it has even been seen in the tails and manes of badly groomed horses. Once secreted it spins for itself a protecting cocoon, and after a time, varying from a few days to as many weeks or even months, it metamorphoses itself into a pupa or chrysalis, when it remains in that state for ten to twenty days, after which it emerges into a perfect insect.

It is thus seen that when the circumstances lend themselves to its uninterrupted evolution during the warmer months, the codlin moth takes 40 to 50 days to pass through its metamorphosis; it often takes much longer. Lea, and with him other careful observers, state that the full-grown grub or larva is, on the other hand, often weeks operating its transformation. It often lies in a semi-comatose state, curled up within its web, all through the autumn and the winter, before it changes into a pupa or chrysalis.

The theory of multiple broods through the summer months is now fading away under the light of modern observation. A certain proportion do metamorphose into moths again during the season, but the majority of grubs pass the winter without changing to pupæ. Lea and others affirm that in most cases only one brood take place during the season.

Just as all the grubs or larvæ do not pupate all at once, so, during the apple season all the moths do not come out at the same time. Those in the gullies, says Lea, will come out later than those in the open, and those on the sunny side of a tree before those on the shaded side.

This irregularity has led many people to think that the moth was double-brooded in Tasmania and other Australian States. The test of complete absence of empty chrysalis cases (not cocoons) in the bandages during January and February is, in Mr. Lea's opinion, conclusive evidence that in Tasmania there is but one brood to deal with.

OUTWARD SIGNS OF WORMY FRUIT.

1. A careful examination of a wormy apple often shows in the locality of the calyx, or the eye, a minute puncture surrounded with the castings of the young grub, more or less entangled in silky web. In some apples this is more apparent than in others.

2. Frequently, when the apples are growing, a brownish, gummy substance may be seen oozing from the eye, and this substance invariably denotes the presence of a grub.

3. When the hole is made in the side, this gummy substance is very seldom seen, and the hole is generally covered with web, to which small particles of excrement adhere. After the grub has left, the hole is generally left partly uncovered, and the excrement (which is frequently matted together with web) rapidly turns mouldy, but it appears never to turn mouldy when the grub itself is present.

4. Wormy fruits often color and show signs of ripening a fort-

night or more before healthy ones, and they will frequently drop. Soon after they strike ground, and often within a day or so, the concussion will urge the grub to come out.

5. When the grub has made its exit a noticeable hole is seen on the fruit.

HOW TO FIGHT THE CODLIN MOTH.

1. The first essential of a successful attack against the codlin moth—and, for the matter of that, against all manner of plagues, blights, and pests—is concerted action.

2. Where an outbreak first takes place in a clean country or district, the readiest and most reliable way of stamping it out is the *starving out* method. This, when carried out with no half-hearted manner, is unquestionably the best means of coping with an outbreak. Thus Mr. Th. A. Tabart, then Chief Inspector under the Codlin Moth Act in Tasmania, in his annual report published 10 years ago:—"I still hold the opinion (which is that expressed by practical orchardists, and some whose very livelihood is dependent on the success of the fruit industry) that the picking of the *whole of the fruit* from orchards where infection has been present during the preceding season must be adopted if any permanent good is desired. It daily becomes more patent that eradication will not be complete from simply picking a portion of infected fruit, leaving a large percentage unpicked, in which the grub is developed and allowed to escape."

3. An ounce of prevention is worth a pound of cure. Never use second-hand fruit cases.

4. The life-history sketch of the moth indicates that each female moth is good for 80 eggs or more, half of which are females. It thus becomes apparent that every worm, or every moth, destroyed at the beginning of the season is worth a great number later. Every effort should then be directed towards their destruction in the early spring. With this end in view all apple-sheds or store-rooms should be thoroughly disinfected by means of Hydrocyanic acid gas, sulphur fumes, or hot steam. Every apple store-room should be made secure against escape of the moth; for this purpose wire screenings should be placed over the inner doors and windows, which should fit well.

5. The apple orchard should be free from rubbish heaps. Wire fences are less subject to harboring the grubs than wooden ones. The ground should be kept well cultivated and clean, and the older trees should have the loose bark scraped.

6. In badly infested districts in Tasmania, which, by the by, has grappled with the codlin moth question with more thoroughness than have yet the other Australian States, "it has been found necessary to so prune the trees as to allow the pickers to see into any part of them; also to keep the trees low, as it is, of course, much more difficult to go over high than low trees."

7. All windfalls in infested localities should be gathered as fast as they come down, as unless this is done the wormy apples will,

after the concussion they have received, be soon deserted by the grub. This should be more particularly attended to in January, February, and March.

8. Night light traps, with a lantern hung over a tin tray containing some sticky substance have been recommended, but the great majority of observers now admit that the codlin moth is not attracted by light, and that when a few odd ones are thus caught the event is more of the nature of an accident.

9. Traps with fresh apple juice sweetened with sugar or honey have been tried in South Australia, New Zealand, and Tasmania with more or less success. Lea used such traps in February and March, and, "so far as the codlin moth was concerned, they were total failures." Possibly, says he, if used in December and January they would have been more successful.

10. Arsenical sprayings is, of all the weapons used against this pest, one of the most deadly. It aims at depositing on the surface of the young apple, pear, or quince—and in such a position where it is likely to be picked up by the young grub soon after it hatches—a bait which will prove fatal. A better understanding of the habit of the codlin larvæ enables us to better encompass its destruction.

Observation has taught that the mother moth lays one egg on each apple. Should the egg be a fertile one, and should it escape detection by natural enemies, it soon hatches; the young grub then instinctively crawls towards the calyx or eye of the fruit, and there has its first feed or two. It also nibbles here and there at the outer surface of the fruit, and after having had a few feeds proceeds to bore into it. It is whilst thus feeding that it picks up the poison. That poison, it is seen, must therefore lie where it is most accessible, and this is done in this way:—After the petals drop, and as the fruit develops, the sepals which are disposed around the eye, and which, when accompanied by the corolla, are uniformly expanded and spreading, soon assume various shapes, covering more or less the tube which constitutes the calyx cavity. It is before these sepals close that cavity that the spraying should be done, and the most propitious time for this operation is about a week after the setting of the fruit. When this is done a certain amount of the poison is imprisoned within the calyx, where we know that most codlin grubs generally have their first meal. Should, however, the spraying be delayed, the poison will not be deposited within the calyx cavity with the same certainty, and fewer codlin grubs will have a chance of picking it up. Should rain supervene after the spraying it is advisable to spray again in order to get at the later hatched grubs, as all moths do not emerge from their chrysalis stage all at once, but come out from October right on till the middle of summer.

Slingerland, commenting on the results of spraying with arsenites, reports that at least 70 per cent of the loss commonly suffered by the fruit-grower from the ravages of the codlin moth could be prevented by thoroughly applying the Paris green once or

twice in the spring, indeed, "thousands of practical fruit-growers, who have thoroughly tried it, are unanimous in their testimony that from 50 to 90 per cent, in some cases, of the fruit that would otherwise be ruined by the insect, can be saved at a comparatively slight expense." Any of the several arsenical poisons may be used, viz.: Paris green, London purple, white arsenic, arsenite of lead, etc. Of these Paris green is the best, when unadulterated, and in the hands of the average fruit-grower, that which is the safest to use.

London purple is variable in its composition and liable to burn foliage. Arsenite of lead is well spoken of by a few. Of all the arsenites, however, Kedzie's Solution, named after the Director of the Michigan (U. S. A.) Agricultural College and Experiment Station, is the most reliable, and it does not, moreover, burn the foliage of the trees, and is very cheap in price. It is thus prepared :

White arsenic	...	...	2 lbs.
Sal soda (washing soda)	...	...	4 "
Water	...	...	2 gallons

Boil for 15 minutes. Put into a glass jar, label "poison," and lock up. When required for spraying slake 2 lbs. of quicklime, which stir in 40 gallons of water, adding 1 pint of the mixture from the glass jar. It is claimed it is easily prepared and is always ready for use, without deteriorating; it does not hurt the foliage as does arsenic; it leaves a whitish colouring on the foliage, showing how evenly the spraying has been distributed, and is cheaper than Paris green.

A good deal of the unsatisfactory results which have attended the use of Paris green are the result of the adulteration of that chemical. The following test will prove its purity:—Boil one gramme (or 10 to 20 grains) of Paris green, with dilute hydrochloric acid; if pure, it should dissolve completely. If there is a residue, wash well over a paper filter, ignite, weigh and test for barium sulphate, a common form of adulterant. In another part of this issue further tests are given for detecting adulteration of Paris green, and to this I must refer enquirers.

11. Bandages, when well applied and carefully attended to, are better than any of the patent traps yet tried. Next to spraying, the greatest number of grubs can be destroyed by its use, and from 40 per cent to 50 per cent of codlin larvæ are said to have thus been entrapped. The bandages are made of wide bands of Hessian, about 12 inches wide, and long enough to encircle the stem of the tree. The piece of stuff is folded in the middle and fastened tightly round the tree by means of twine.

"According to the regulations at present in force in Tasmania, the bandages should be placed on the trees in November, and finally taken off not later than the following July." They should be removed every eight or ten days and boiled—this boiling also destroys a great many eggs of red spiders—and then replaced. This is preferable and more reliable than an eye inspection of the bands, whereby a certain number of grubs are generally allowed to

escape unnoticed. On going over the trees, when the bandages are removed, a pointed probe should be used to search out all grubs which may have secreted themselves under pieces of bark, or eaten for themselves a hiding-place into the bark, broken branches, forks of the limbs, or old scars—as they prefer such places to the bands. Two bands, one over the other, are sometimes used, as some of the grubs, at times, crawl over the first in search of a hiding-place more to their liking. “For a considerable number of trees examined,” says Lea, “I found that where the trees had been properly bandaged, four grubs would be found in the bandages to one in the bark beneath them; doubtless in the rougher-barked trees many of the grubs never came as far as the bandages, and, in many instances, more grubs will be found in the bark than in the bands, especially if these cross an old saw-scar.” These bands answer a good purpose, but some growers successfully supplement them by placing among the lower limbs and on the ground around the trees, other traps, made of sandwiching a piece of sacking between two shingles, and joining these together with a nail. These traps are easily made and laid, and as easily gathered up and inspected.

Although bands answer a good purpose, they must be applied to other kinds of trees, and even to fencing posts around the apple, pear and quince trees, to do all the good which may be expected from them.

Mr. George Compère, who has done valuable work in Australia and China for the State Board of Horticulture of California, and who is now attached to this Department, mentions another easy way of gathering and destroying the codlin grub in California. Long straw is lightly scattered about the trees in the summer, and then raked up into small heaps and set fire to.

NATURAL ENEMIES AND PARASITES.

12. Probably the greatest distributor of the codlin moth is the fruit-grower himself, and the compulsory spraying and bandaging in force in Tasmania meet with many opponents, says Lea. “Firstly, from those people who object to being compelled to do anything; secondly, from those who think it useless; thirdly, from those who, on account of their orchard being lightly infested, think it is too expensive to bandage and spray hundreds, or perhaps thousands, of trees to catch a few grubs.” That class of people will always be found in any community, and therefore it is to natural enemies and to internal parasites of the codlin grub that we must look to in order to minimise the tax it levies on infested orchards. It is a fact worth noticing that, in those countries where the apple tree found its birth place, there nature has wisely provided natural enemies, whose functions in life is to keep in check those insects which prey on the fruit. In America, in Australia, and in South Africa, where apples, although introduced, flourish as well, if not better than on the continent of Europe, the codlin moth was also introduced, but many of its natural enemies and parasites must have accidentally been left behind. The balance of nature has in consequence been disturbed, and the moth has been having it

pretty well all its own way. Artificial means, such as fumigation, spraying, bandages and quarantine laws have, no doubt, done good work, but gradually and surely the pest is spreading, and is getting more troublesome. In Devonshire, in Herefordshire, in Normandy and other localities famed for their apples all the world over, no fumigating, no spraying, no bandaging are practised, and yet there apple growing continues to be a remunerative and a national industry. It is to these localities that the American, the South African and the Australian apple growers will have to look for help, in the shape of codlin parasites.

The Americans are now well impressed with this fact, and they are already out in the field collecting these parasites and enlisting them in their warfare against the moth.

What these natural enemies are is a question of considerable moment for the apple growers, and a list is here given, many names of which are taken from Mr. A. M. Lea's report.

Birds.—Hens in an infested orchard pick up a great number of codlin grubs and tear them out of their cocoons, in fact they can easily be trained to follow those engaged in lifting the bandages, and are found to be of great assistance. In America, woodpeckers and robins unceasingly seek after these worms during the winter months. In Tasmania, goldfinches, crows, starlings, and sparrows eat enormous numbers of the grubs, the last two however, in other ways prove themselves destructive birds. In Germany and other parts of Europe the tom-tits do good work.

Mammals.—Mice, and rats and bats devour many of these insects.

Insect enemies are numerous, of these the internal parasites are amongst the most useful. They include three from Europe, *Campoplex nemorum*, *Pachymerus vulnerator*, and *Phygadeuon brevis*. Hair worms (*Gordius*), have been seen in grubs in the United States of America and Europe. From the United States a small wasp (*Trichogramma pretiosa*), is parasitic on the eggs. An Ichneumon (*Macrocentrus delicatus*), and a fly (*Hypostena variabilis*), are parasitic on the grubs when in the fruit; another Hymenopterous insect (*Goniozus*), is an external parasite, an Ichneumon (*Pimpla annulipes*), destroys the pupæ. In California, a wasp (*Sphecius Nevadensis*), "frequents pear trees and is described as pulling the grubs out of the fruit with its fore foot" says Slingerland. After the grubs have left the fruit more enemies beset them. In America three soldier beetles (*Chauliognathus Pennsylvanicus*, *C. marginata* and *Telephorus bilineatus*) feed on grubs and pupæ as well also on a Neuropterous insect (*Rhaphidia*), and other beetles destroy pupæ, viz., *Trogosita laticollis* and *T. corticalis*. In Tasmania and Australia two common soldier beetles *Telephorus pulchellus* and *T. ruficollis* eat grubs. The spotted ladybird (*Leis conformis*) devours young grubs and even pull these from the fruit when it just starting boring. Ground beetles, and among them (*Gnathaphanus pulcher*), one which occurs on the mainland. Bugs of the genera *Reduvius* and *Pentatoma* destroy grubs sometimes even before these have left the fruit. Even the much despised earwigs eat numbers of the grubs,

and then afterwards will turn their attention to their excrements, and to the apple itself. Spiders and centipedes eat the grubs, and the former the moths as well. Although a long list is here given of natural enemies of the codlin moth, nevertheless the fact remains that many more must exist, and also that they have proved themselves to be inadequate in their isolated efforts in appreciably keeping down the codlin moth. How far their introduction from distant parts and their concentration in codlin moth infested localities will prove effectual in combating that dreaded pest is a problem which awaits solution at the hands of economic entomologists.

THE "COTTING" OF WOOL.

Sometimes wool buyers complain of the large quantity of matted or "cotted" fleeces found in a bale of wool, and often, certainly without consideration, the price of the whole quantity of a certain class is lowered thereby. Matting may be due to two causes. One, as a leading wool expert explains, is due in the failure of the sheep to produce a sufficient quantity of yolk, which acts as a lubricant or pomatum, and prevents the serrated edges of the fibre from interlocking and felting together. Wet weather may also influence and cause this, because it washes out the yolk, which is more or less soluble in water, and this leaves the fibre in a condition most ready to mat. Poor feed means loss in condition and poverty of coat. The fibre becomes dry, harsh, and brittle, thus increasing the tendency to mat. Improper dipping, and the sheep being infected with vermin, ticks, or other skin diseases, all of which check the production of yolk, also cause matting. The longer the staple of wool and the opener the fleece the greater the tendency to cot or felt. In several parts of Australia there are grasses, such as the so-called bind-eye, that produce a small prickly seed with tentacles, which once they get into the fleece soon mat the staples together. And it is this class of wool that buyers most find in the bales, for, on the whole, the sheep of Australia are in a remarkably healthy condition. That wool-growers sometimes get a lower price for their wool than they have a right to expect is their own fault. It is due entirely to faulty classification, or more, to the absence of classing. One would think that by now wool-growers must have learned the folly of the idea that unclassified wool will bring as much as classified. It may be so when a buyer has only a small quantity of a certain quality to choose from, but in such a case the result has, as a rule, been a loss to the manufacturer. Judging by experience, I find that imperfect classing causes greater loss to the grower than not classing at all. Even supposing that the number of matted fleeces in a whole clip do not exceed a score, it is better to put them with the lower grades or mark "matted" on the part of the bale in which they are placed.

GOVERNMENT IMPORTATION OF PRIZE STUD STOCK.

The consignment of the prize stud stock recently purchased by the Western Australian Government from the Eastern States has all arrived safely in this State. The Secretary of the Department of Agriculture has received a letter from Mr. Neil Campbell, the gentleman selected to purchase the stock, from which the following extracts are taken :—" I beg to report having purchased, on behalf of the Government of Western Australia, the following stock :—

BERKSHIRES.—One Berkshire boar, 'San Toy,' bred by the trustees of the late George Madden, second prize-winner under twelve months at the Royal Show. This is an extremely nice pig, the first prize winner only beating him on account of size, being slightly larger. I have also purchased the sow 'Silver Bell,' in pig to 'Wellington,' and the sow 'Mona,' in pig to 'Justice,' at 16 guineas each. These were two of the nicest young sows in the show.

HORSES.—" I was unable to obtain any horses at the show ; prices were too high, or else, where the price was reasonable, the stock was inferior. I have, however, purchased a horse in Melbourne that will meet your requirements. His name is 'Kinrara,' five years old, by 'Kintore,' by 'Honesty,' dam 'Maggie Harold,' by 'King Harold.' This is not a tall horse, but full of quality, and is set on a splendid set of legs, and will be very valuable in getting high-class hackneys. He is a great mover, and is broken to harness. He has a show record of 12 first prizes, including the Sydney Show, in which he beat a large class, including Mr. Hordern's best roadsters.

AYRSHIRES.—" In this matter I am pleased with my purchases, and feel sure that your Government, cannot fail to be so also. The aged bull 'Peverill,' six years ; the two-year-old bull 'Hamilton,' and the cow 'Julia I,' should win in first-class company anywhere in their present condition ; in fact, the two-year-old bull, who was second at the Royal, is considered by five out of six judges to have been better than the first prize winner. For myself, I am entirely of the same opinion as the majority. The older bull is not in special show condition, nor is the cow 'Lady Louisa.' The heifer, which is in calf to Glen Elgin's 'Hero,' you will notice is merely off the grass, and was not shown at all, but she combines in her breeding all the very best Ayrshire strains in Victoria, and is in herself a heifer of very high show class when got up for show. I bought this heifer particularly on account of the beautiful combination of Ayrshire blood. You have Ayrshires now all bred out from each other, and the result of the two that are in calf will give

still further fresh strain. I feel certain that in my purchases in this class, should the judges at your show be expert Ayrshiremen, you must win.

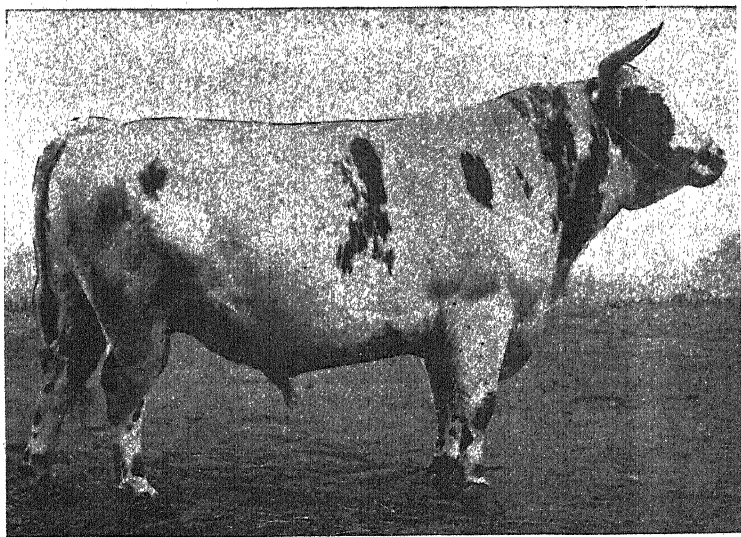
“KERRIES.—I have obtained the three heifers and the bull from Mr. Syme. The whole of the cattle are undergoing the tuberculin test.

“In your instructions you were good enough to leave matters pretty well to my discretion, and you will note that I have departed from the original instructions in the matter of purchase of two Ayrshire bulls and three cows in place of three bulls and two cows. I will forward you a catalogue showing these cattle and their full pedigrees, and, on your submitting the same to any breeder of stock, he will see that in what I have done it would be almost impossible to better in the hope of getting first-class results. I could not get the third bull that I particularly fancied, but the two bulls that I have purchased are admitted by all the Ayrshiremen in Melbourne to be two of the very finest bulls at the Melbourne Show.”

All the animals will be exhibited at the forthcoming Royal Agricultural Show at Guildford, on the 29th and 30th inst., for sale, but will not be entered for competition.

Following are the pedigrees, etc., of the whole of the stock now owned by the Department of Agriculture :—

AYRSHIRE BULL “PEVERILL.”



AYRSHIRE BULL—“PEVERILL”

Bred by Mr. John Grant, Seafeld, Tullamarine, Victoria.

His color is the true Ayrshire red and white. He was calved

on August 18th, 1895, and is consequently 6 years old. His pedigree shows him to be an exceptionally well-bred animal.

Calved August 18th, 1895.

Sire—Scotland (84, A. H. B. of A.)

Dam—Ada 3rd of Seafield (3, A. H. B. of A.), by Bruce (11, A. H. B. of A.)

g. dam—Drumlanrig's Ada 8th (104, A. H. B. of A.), by Duke of Randwick (imported, 342, A. H. B. of S.; 28, A. H. B. of A.)

g.g. dam—Drumlanrig's Ada 4th (103, A. H. B. of A.), by Duke of Randwick (imported, 342, A. H. B. of S.; 28, A. H. B. of A.)

g.g.g. dam—Ada of Drumlanrig (imported, 617, A. H. B. of S.; 6, A. H. B. of A.), by James 1st.

g.g.g.g. dam—Caroline, by Heather Jock.

Ada 3rd of Seafield took first prize, one year old heifer, Royal Show, Victoria, 1901.

Drumlanrig's Ada 8th, winner of Ayrshire Derby Sweekstakes, Royal Show, 1889.

Drumlanrig's Ada 4th (3,465, A. H. B.), has won 30 prizes, including 27 firsts and specials, winning the Grand Champion of Australia at the Melbourne National Agricultural Show, 1884, as the best Ayrshire female, any age, competing against imported and colonial stock, her sire, Duke of Randwick (imported, 342, A. H. B.) winning the Grand Champion of Australia at the same show as the best Ayrshire bull, any age. Drumlanrig's Ada 4th also won the grand champion prize at the Royal Show of Melbourne (late the National Agricultural Show of Victoria), in 1891, as the best dairy cow, any age or breed, being the only cow that has won the grand champion prize at Melbourne as the best Ayrshire cow and the grand champion as the best dairy cow, any breed. At the Centennial show at Melbourne in 1888, she won the first prize as best Ayrshire cow, dry, in calf; and in 1890 she won the first prize as best Ayrshire cow in milk, being the only cow that has won the first prize both as a dry cow and as a cow in milk at the Melbourne show, showing she was such a grand type of an Ayrshire cow that she could win whether she was shown as an Ayrshire cow in calf or an Ayrshire cow in milk, or as a dairy cow, any breed, in any company. She has won fourteen first and special prizes as best dairy cow, any breed, and thirteen first and special prizes as best Ayrshire cow.

Scotland (84, A. H. B. of A.), was bred by the Hon. Wm. McCulloch; sire, Snowball (imported, 1,572, A. H. B. of S.; 85, A. H. B. of A.); dam, Lizzie 2nd of Boydstone (5,501, A. H. B. of S.; 226, A. H. B. of A.), by Brown Muir; grand dam Lizzie, by Duke of Dalry (17, A. H. B. of S.) Scotland is the sire of the first prize two-year-old bull, first prize two-year-old heifer, and second prize one-year-old heifer at Royal Show, Melbourne 1895.

AYRSHIRE BULL "HAMILTON."

Color, brown and white, calved on October 18th, 1899, and is two years old. His pedigree is as follows.

Sire—Bothwell (109, A. H. B.)

Dam—Plum of Seafield (767, A. H. B.), by Scotland (84, A. H. B.)

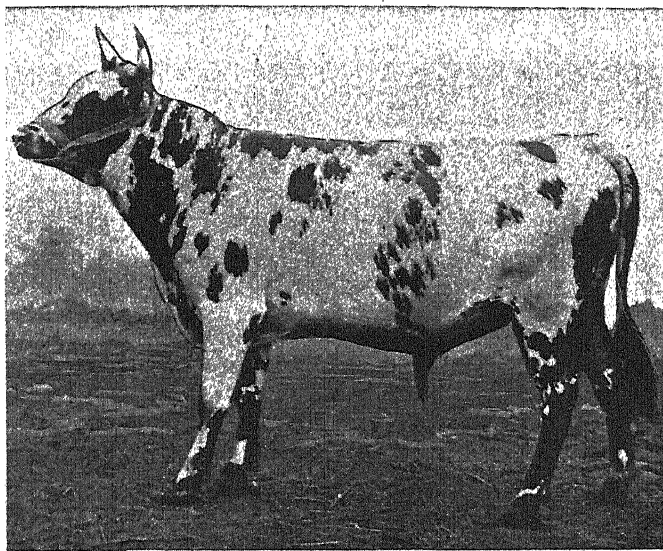
g. dam—Pansy 3rd (274, A. H. B.), by Duke of Randwick (imported, 342, A. H. B. of S.; 28, A. H. B. of A.)

g.g. dam—Pansy, by The Miller (86, A. H. B.)

g.g.g. dam—Nora, by Colin.

g.g.g.g. dam—Lady Hamilton, by D. McLean's imported bull.

g.g.g.g. dam—Blanche (imported from Scotland).



AYRSHIRE BULL—"HAMILTON."

Bred by Mr. John Grant, Seafield, Tullamarine, Victoria.

Pansy 3rd (274, A. H. B.) took first prize for two-year-old, National Agricultural Society of Victoria, 1885; first prize three-year-old Ayrshires, National Agricultural Society of Victoria, 1886; first and champion prize, West Bourke, 1887.

Pansy got second prize for Ayrshire cow, National Agricultural Society of Victoria, 1883; first prize for Ayrshire cow, West Bourke Show, 1882.

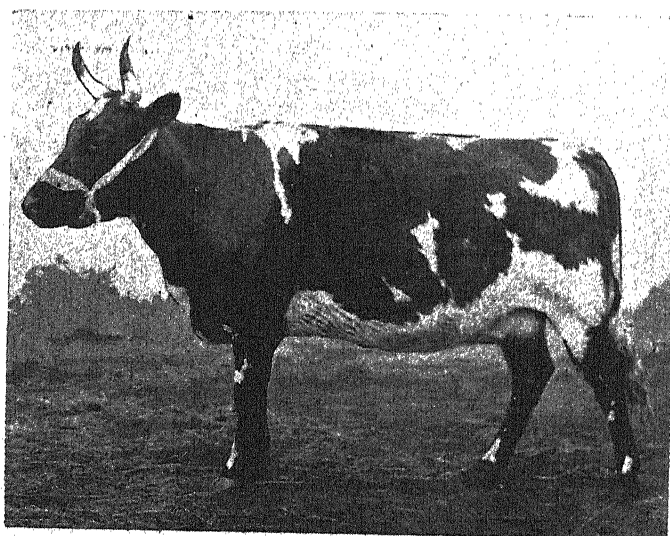
Nora got first and champion prize for best Ayrshire of either

sex exhibited at National Agricultural Society Show, November, 1879.

Lady Hamilton got first prize for Ayrshire cow, West Bourke, 1880.

Blanche got gold medal, Geelong Show, 1867.

AYRSHIRE COW "LADY LOUISA 2ND."



AYRSHIRE COW "LADY LOUISA 2ND."

Bred by Mr. Angus McNab, Victoria Bank, Tullamarine, Victoria.

Color, red and white, calved September 1st, 1896, and in calf to Bonnie Jock.

Sire—Nethercraig.

Dam—Lady Louisa, by Carlisle (17, A. H. B. of A.)

g. dam—Princess Louisa (289, A. H. B.), by Duke of Barbiston 15th.

g. g. dam—Louisa 6th (581) by Lord Ronald (57, A. H. B. of A.)

g. g. g. dam—Louisa 2nd, by Highland Laddie (491).

g. g. g. g. dam—Louisa, by Old Rob Roy.

g. g. g. g. g. dam—Petty, by Geelong Billy.

g. g. g. g. g. g. dam—Nellie, by Nelson.

g. g. g. g. g. g. g. dam—Mallie, by Bobbie.

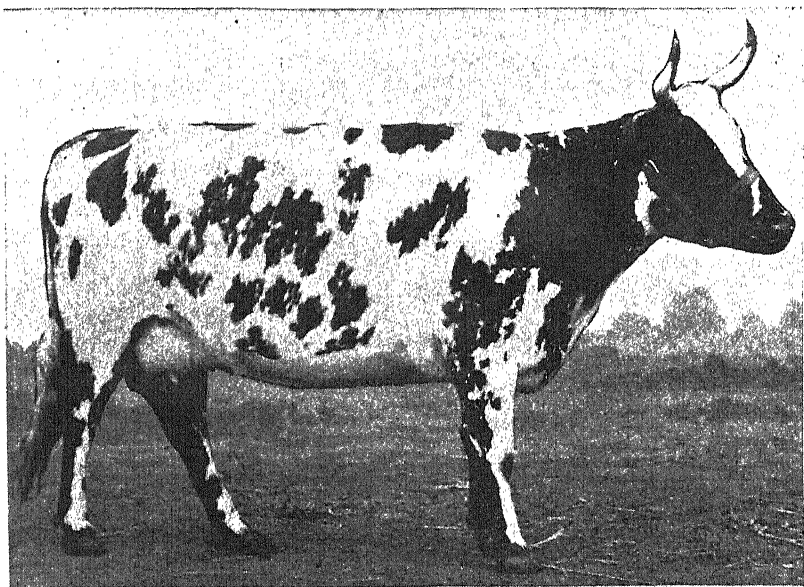
g. g. g. g. g. g. g. g. dam—Annie (imported).

Lady Louisa 2nd was shown last year at the Royal Show, Melbourne. She was placed fourth in the dry Ayrshire cow class.

Louisa and took first prize at Royal Show Melbourne, 1898, as one of a pen of three dairy heifers.

Nerthercraig is by Scotland (84, A. H. B. of A.); dam, Drumlanrig's Ada 8th (104, A. H. B. of A.) by Duke of Randwick (342, A. H. B. of S.); grand dam, Drumlanrig's Ada 4th.

AYRSHIRE COW "JULIA 1ST."



AYRSHIRE COW—"JULIA 1ST."

Bred by Mr. James Gemmell, New Zealand

Color, brown and white; age, 4 years and 8 months.

Sire—Baron of Ayr.

Dam—Julia, by Baron Oxhill (imported).

g. dam—Emma 1st, by Premier, out of Old Violet.

g.g. dam—Emma, by Champion (imported).

g.g.g. dam—Emerald, by Charlie, by Brogden.

g.g.g.g. dam—Ruby, by Bismark.

g.g.g.g.g. dam—Mary, by Young Jock, by Ivy, by Ayrshire Jock (imported).

g.g.g.g.g.g. dam—Milkmaid, by Ayrshire Jock (imported).

Baron of Ayr, winner of many first prizes in New Zealand.

Baron Oxhill (imported), bred by Mr. J. McFarlane, Oxhill, Buchlyvie, Scotland; sire, Baron Buchlyvie (281); dam, Kate, winner of first at Drymen as a one-year-old heifer; first at Drymen as a two-year-old; and first at Buchlyvie as a three-year-old heifer in milk. Baron Oxhill is at present the champion bull of New Zealand, having taken champion prizes wherever shown.

Old Violet was awarded fifty-one (51) first prizes at the leading shows in New Zealand.

Champion was imported in 1879 by Mr. Cook, and was bought by Mr. James Gemmell for 170 guineas at auction in Dunedin, N.Z. Champion was shown at all the principal shows in Scotland, and was unbeaten until he met Old Champion, the property of Mr. James Gemmell at the Oamaru Show, N.Z., in 1879. He took nineteen first prizes before leaving Scotland, and eleven in New Zealand while being the property of Mr. James Gemmell. Champion's stock have proved themselves unequalled in New Zealand, his strain of blood on both sire and dam's side having been prize takers at the principal shows in Scotland for generations back.

NOTE.—Ayrshire Cow "Julia 1st" is in calf to "RODERICK."

AYRSHIRE HEIFER "ANNA."

Bred by Mr. T. A. Grant, Glen Elgin, Victoria.

Color, brown and white, calved November 20th, 1899, and is now in calf to Glen Elgin's Hero.

Sire—Gordon.

Dam—Annie Laurie of Glen Elgin (16), by Ada's Earl of Oakbank.

g. dam—Annie Laurie 2nd of Oakbank (1), by 21st Duke of Barbiston (26).

g.g. dam—Annie Laurie of Oakbank (8), by Southern Chief (81).

g.g.g. dam—Annie Laurie (7), by Rival of Drumlaurig (78).

g.g.g.g. dam—Dina, by Dunlop (25).

g.g.g.g.g. dam—Katie 2nd, by Rob Roy (79).

g.g.g.g.g.g. dam—Katie, by old Rob Roy (67).

g.g.g.g.g.g.g. dam—Mollie, by Bob.

g.g.g.g.g.g.g.g. dam—Maggie, by Bob.

g.g.g.g.g.g.g.g.g. dam—Annie (imported).

Gordon, winner of first prize at Ballarat as a yearling, 1890, beating in his class the bull that won the champion prize in Melbourne the following year; first and champion at Bacchus Marsh 1892, 1896, 1897, and 1898; first and champion at Ballan, 1898; first at Kyneton, 1893; first and special herd book prize at Melbourne, 1893, together with the grand champion prize of Australia. Gordon is the sire of the champion Ayrshire and dairy cows, and winner of Lord Brassey's gold medals, Oakbank.

Annie Laurie of Glen Elgin was awarded first prize, Royal, Melbourne, 1890, as a yearling; first prize, 1891, as a two-year-old; second prize, 1892, as a three-year-old, and H. C., 1897, as an Ayrshire cow; first prize Bacchus Marsh, 1890, as a yearling; first prize as a two-year-old, 1891; first prize and champion, 1892 and 1898; first prize West Bourke, 1892; first prize as one of a group of dairy cattle, Kyneton, 1892; and second prize as one of a pair of dairy cows, Bacchus Marsh, 1898.

Annie Laurie 2nd of Oakbank (1) has been awarded the following prizes:—Second prize National Agricultural Show, Melbourne, 1888, as a one-year-old; first prize Bacchus Marsh, 1888,

as a one-year-old; first prize Kyneton, 1888, as a one-year-old; second prize National Agricultural Show, Melbourne, 1889, as a two-year-old; first prize Bacchus Marsh, 1889, as a two-year-old; second prize Bacchus Marsh, 1890, as Ayrshire cow; first prize Bacchus Marsh, 1891, as a dairy cow, open class; first prize Bacchus Marsh, 1892, as a dairy cow, open class; second prize Royal, Melbourne, 1892, as a dairy cow in calf; first prize as one of a group of dairy cattle, Kyneton, 1892. She is also the dam of Glen Elgin's Bruce, the champion bull, Royal, 1894, 1895, 1896, and 1897, and many other noted prize-winners; and is half-sister to the four times champion cow Alice of Oakbank, viz., 1896, 1897, 1898, 1899, both being out of Annie Laurie of Oakbank.

Annie Laurie of Oakbank was first as a one-year-old in 1886; second in 1887; second in 1888; second in 1889 at the Royal Society Show, Melbourne; being beaten on each occasion by her herd mate, champion and centennial winner, Blue Belle of Oakbank; first as a dry dairy cow in 1890 at same show, and highly commended in 1891; first at Ballarat in 1890 and many other prizes at Bacchus Marsh, Kyneton and St. Arnaud Grand National Show. She was sold at auction for 80 guineas, Mr. Jas. Gibb, of Berwick, being the purchaser.

BERKSHIRE SOW "MONA."

Bred by Mr. W. Looby, Brookfield, Milbrook, Victoria.
Under 12 months old, and has been served by "Justice."

Sire—Wellington, by Sir John.

Dam—Dainty II., by Lord Nelson, by Waverley, by Lord Torrens.

g. dam—Dainty, by Lord Hamilton.

Wellington—By Sir John; sire, Maori Chief 2nd; dam, Jubilee, by King Tom, bred by W. K. Thomson, Esq.; g. dam, Ornamental, by Thumper, bred by J. Horwood, Esq.; g.g. dam, Lady Champion 2nd, by Duke of Beeac; g.g.g. dam, Lady Champion, by Prince Charlie.

Justice—Sire, Outlaw; dam, Darky, by Admiral; g. dam, Lady Elcho, by Lord Elcho; g.g. dam, Norah 2nd, by King Tom 2nd; g.g.g. dam, Norah, by Berkeley Knight.

BERKSHIRE SOW "SILVER BELL."

Bred by Mr. W. Looby, Brookfield, Milbrook, Victoria.

Under 12 months old, and has been served by "Wellington."

Sire—Conqueror, by Abel, by Sultan.

Dam—Primrose, by Lord Clyde, by Lord Grenville.

g. dam—Countess 1st, by Jack (imported by W. K. Thomson, Esq.)

Conqueror—By Lord Clare, by Abel, by Sultan; dam, Rosebud, by Lord Carrington (imported); g.g. dam, Victoria (from imported stock); g.g.g. dam, Matchless, by Gladstone by Beaconsfield (imported).

Wellington—By Sir John ; sire, Maori Chief 2nd ; dam, Jubilee, by King Tom, bred by W. K. Thomson, Esq. ; g. dam, Ornamental, by Thumper, bred by Joel Horwood, Esq. ; g.g. dam, Lady Champion 2nd, by Duke of Beac ; g.g.g. dam, Lady Champion, by Prince Charlie.

BERKSHIRE BOAR "SAN TOY."

Bred by the Trustees of the late Mr. George Madden.

Winner of second prize for best Berkshire Boar under twelve months old at Royal Show, Melbourne, 1901.

Sire—Federated.

Dam—Little Trilby, by Trafford's Hero.

g. dam—Trilby, by Maori Chief 2nd, by Maori Chief.

g.g. dam—Maggie Moore, by Windsor Boy.

g.g.g. dam—Clarinda, by Thumper (bred by Joel Horwood, Esq.)

Little Trilby was first and champion sow Melbourne, 1899.

Federated (imported)—Sire, Earl Augustus, by Marnhull Duke, by Marmaduke, 4,059 (champion at the Royal Counties Show, 1897, against 27 others), from Odele (4,222) ; dam, Trafford Pretty (a Sydney champion sow), by Humphrey (imported), bred by Sir H. M. Trafford ; g. dam, Sultan Pretty, by Young Sultan, by Sultan from Maggie ; g.g. dam, Pretty, by Town's Jack I. from Miss Towns.

TAMWORTH SOW "LADY MELTON."

Bred by Mr. G. T. Chirnside, Werribee Park, Werribee, Victoria.
Farrowed March 5th, 1900.

Sire—Middleton Melton, by Middleton Mate (4,585).

Dam—Werribee Lady (imported), by Norman.

g. dam—Cliff Colonist (imported), by Cliff Clinker (4,547).

g.g. dam—Cliff Crocodile, by Knowle Rector (2,783).

g.g.g. dam—Castle Bromwich Maud (4,236), by Gold Finch (2,505).

g.g.g.g. dam—Gun Hill Confidence (3,748), by Gun Hill Prince (1,591).

g.g.g.g.g. dam—Gun Hill Princess (2,520).

TAMWORTH SOW "LADY KNOWLE."

Bred by Mr. G. T. Chirnside, Werribee Park, Werribee, Victoria.
Farrowed March 12th, 1900.

Sire—Pride of New Zealand (imported).

Dam—Knowle Duchess III. (imported), by Knowle Rambler (4,950).

g. dam—Knowle Duchess II. (5,436), by Warwickshire Monarch (4,951).

g.g. dam—Warwickshire Queen (7,827), by Knowle Marquis (3,329).

g.g.g. dam—Warwickshire Rose (5,688), by Gun Hill Prince (1,591).

g.g.g.g. dam—Warwickshire Gun.

TAMWORTH BOAR "KING RUFUS."

Bred by Mr. J. Rowe, Christchurch, New Zealand.

Farrowed September 1st, 1897.

Sire—President (imported).

Dam—Windsor Queen (imported), by Excelsior.

SHORTHORN BULL "PRIDE OF ARGYLE."

Bred by Mr. McKenzie Grant, Newmarracarra, Western Australia.

Calved on January 10th, 1899.

Sire—"Pride of the Lake," by Kirklevington Count 2nd;

by Baron Graham (41,030), dam Countess of Levington 2nd;

by Oxford Bean, grand dam Countess of Levington;

by Lord of the Isles (34,631).

Dam—Campbell House Queen (imported), bred by T. R. Bowman, Esq., of Campbell Park, South Australia, and descended from the well-known "Canowie Herd" and noted M over 7 brand.

DEXTER KERRY BULL "KILLARNEY."

By "Denham Melbourne" (imported, D. H. B. 94), out of Denham Olive (imported, 67 D. H. B.) His mother gave 15 to 16 quarts of milk daily. Denham Melbourne took first prize and Queen's gold medal at the Royal Show at Windsor, England, in 1889, and two firsts and champion at Royal Show in Melbourne in 1893 and 1894.

Calved March 10th, 1896.

Sire—Denham Melbourne (imported, 94 D. & K. H. B.)

Dam—Denham Olive (imported, 67 D. & K. H. B.)

Denham Melbourne, by Limelight (12), dam, Denham Molly (66).

Limelight took first prize and Queen's gold Medal at Royal Agricultural Society's Show, Windsor, England, 1889.

Denham Melbourne took two firsts and a champion at Royal Agricultural Society's Show, Melbourne, in 1893 and 1894.

DEXTER KERRY BULL "BLYTHSWOOD FASCINATOR."

Is by Fascination (No. 6, Dexter Herd Book) out of Marguerite, out of Aster, first and champion in Royal Show, Melbourne, 1893 and 1894. His mother gave about 15 quarts of milk daily.

Calved May 12th, 1893.

Sire—Fascination (6, D.H.B.)

Dam—Marguerite.

g. dam—Aster (imported).

JERSEY BULL "FOWLER LAD."

Is by Fowler King out of Lassie Fowler, and has never been shown. By well-known judges he is said to be the finest made bull of his age in Australia. His mother is a great milker, and milks

right up to next calving time, and his grand dam makes one pound of butter to thirteen of milk. In a cream test his mother showed 38 per cent. of cream on the night's milk.

Sire—Fowler King.

Dam—Lassie Fowler, by Laddie Fowler.

g. dam—Fairy Lass (imp.), by Mourier King (1115).

g. g. dam—Flower Maid (2796), by Volunteer.

Fowler King is by May Queen.

May Queen took first prize in Adelaide, the only time shown.

Fowler Lad traces through Carlo III. to the two famous cows, Garenne (1575), and Comassie (1442). Garenne gave 20 quarts of milk, and sold for £750. Comassie, champion cow of Jersey 1878, 1879, 1880, and gave 16lbs. 11 ozs. of butter in 7 days. Thirty-two cows of this family gave average of 16lbs. 9 ozs. butter in a week.

JERSEY BULL "PROGRESS FAIRLY."

Is by Progress III., said to be the best bull that ever left the Island of Jersey. His dam was Lassie Fowler, out of Fairy Lass, imported from Jersey. Progress Fairly has never been shown. He is descended from the champion cow Angela, in Jersey, and also Musique. The former cow gave 15 lbs. of butter and the latter 20 lbs. 5 oz. in one week under test.

Sire—Progress III.

Dam—Lassie Fowler, by Laddie Fowler.

g. dam—Fairy Lass (imported), by Mourier King (1115, J.H.B.)

g. g. dam—Flowery Maid (2796, J.H.B.)

JERSEY BULL "FOWLER KING."

Took first and champion prizes in Adelaide at the Royal Show in 1895 and 1896, and his dam, Queen May, was first the only time shown. He is by the imported bull from Jersey (Laddie Fowler) out of the imported cow (from Jersey) Queen May. This bull, Fowler King, is descended from "Garenne," that gave 20 quarts of milk daily, and was sold for £750.

Sire—Laddie Fowler.

Dam—Queen May, by May Jolly (983, J.H.B.)

g. dam—May Queen II., by Carlo III. 817, H.C.)

Queen May traces back to such noted winners as Carlo III., Welcome, Cicero, Happy, Victor, Vertummus, and runs back to those two queens of the Jersey Stud Book, Comassie and Garenne.

JERSEY BULL "JUPITER."

Won three times first prize and champion in Adelaide. His sire, "Jove," won first in Melbourne, and first and champion in Adelaide. His dam was the imported cow "Baggage," first in Melbourne and Adelaide. The sire of "Baggage" was Cicero, the first prize bull in Jersey, and sold to go to America for £750. Jupiter is descended from the famous cow Comassie, the champion

of Jersey in 1878, 1879, and 1880, and made 16 lbs. 11 oz. of butter in one week, and 32 of her descendants averaged 16 lbs. 9 oz. of butter per week.

Sire—Jove.

Dam—Baggage, by Cicero (265, J.H.B.)

g. dam—Bagotine, by Brisk (261, J.H.B.)

YOUNG JERSEY BULL "LILLIAN'S PROGRESS."

Calved August, 1900.

Sire—Fowler Lad.

Dam—Lillian, by Progress III.

g. dam—Bee (imported).

YOUNG JERSEY BULL "FOWLER BOY."

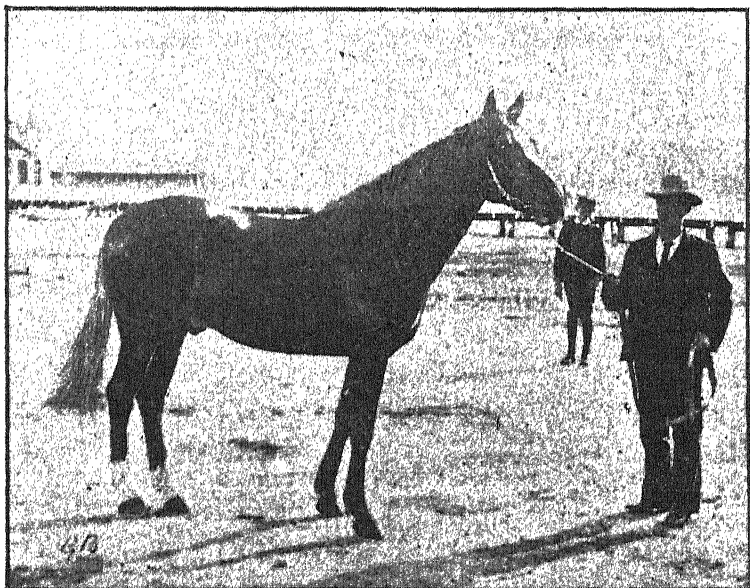
Calved July, 1900.

Sire—Fowler Lad.

Dam—Maud I., by Neatboy.

g. dam—Maud (imported).

ROADSTER STALLION, "KINRARA."



ROADSTER STALLION "KINRARA."

Dapple bay, 15.2 hands.

Sire—Kintore, by Honesty.

Dam—Maggie Harold, by King Harold.

Honesty—Sire, Priam; dam, by Chieftain.

King Harold—Sire, Childe Harold; dam, Sylph.

DEXTER KERRY BULL "DERRY."

Bred by David Syme, Esq., Victoria.

Calved December 30th, 1899.

Sire—Denham Melbourne (imported).

Dam—Killarney III. (imported).

DEXTER KERRY COW (68) "DENHAM DAISY."

Bred by David Syme, Esq., Victoria.

Calved December, 1898.

Sire—Denham Melbourne.

Dam—Marguerite.

This cow has been served by "Hottentot."

DEXTER KERRY COW (175) "DENMAR."

Bred by David Syme, Esq., Victoria.

Calved October, 1898.

Sire—Denham Melbourne.

Dam—Margaret.

DEXTER KERRY COW (12) "DALYDEN."

Bred by David Syme, Esq., Victoria.

Calved December, 1898.

Sire—Denham Melbourne (imported).

Dam—Dahlia.

This cow has been served by "Hottentot."

Analysis of Soils obtained from the District of Leonard River, Kimberley.

At the request of the Under-Secretary of Lands the analysis of soils (given on page 293) obtained from the Leonard River district, Kimberley, has been made for the purpose of showing the possibilities of cultivation.

Mr. Dougall reports in connection with above:—"All these soils are alluvial deposits of an argillaceous nature, and have the elements of making first-class soils.

"Like all the soils that have come to me from the North-West they are very poor in organic matter. They would be greatly improved by a large dressing of well-rotted long grass ploughed into them, which would not only add organic matter, but render them less liable to crack in the dry weather, and in this respect they would be still further improved by a dressing of lime. It is quite evident they should be drained to get rid of some of the salt.

"The lands would be easy to work, more especially if they had a dressing of lime.

"I consider them eminently suitable for tropical crops such as rice, cotton, sugar cane, maize, etc."

ANALYSIS OF SOILS OBTAINED FROM NEAR LEONARD RIVER, KIMBERLEY.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.
Moisture	2.5344	3.4086	3.1728	2.9939	4.0853	3.6735	2.9852
Organic Matter	2.9293	3.6671	4.1653	4.0305	3.0812	3.2738	3.6626
Soluble Silica .. ..	.0147	.0201	.0306	.0450	.2807	.2950	.2333
Phosphoric Acid .. ..	.0894	.0402	.0229	.0410	.0364	.0285	.0310
Oxide of Iron and Alumina	5.1835	6.4314	5.7757	6.3224	5.9526	6.8950	7.5468
Carbonate of Calcium .. ..	.7765	1.6995	.8659	1.2031	2.8551	1.1515	1.0164
Magnesia .. ..	.3705	.3475	.3678	.3823	.3774	.3568	.3529
Potash .. ..	.0894	.0919	.0795	.0997	.0900	.1075	.0692
Salt .. ..	.2565	.2815	.2864	.2377	.2443	.3473	.2690
Fine Sand and Clay	86.1058	80.0078	81.1905	82.8362	78.8372	79.1386	78.2400
Coarse Sand	1.7000	4.2510	4.2000	2.1600	4.1900	4.8300	5.8880
Nitrogen	100.0498	100.2466	100.1584	100.3721	100.0202	100.0975	100.2344
Equal to Ammonia .. ..	.056	.042	.070	.070	.056	.056	.042
	.68	.051	.085	.085	.068	.068	.051

18th July, 1901.

S. S. DOUGALL.

SPURIOUS PARIS GREEN.

By A. DESPEISSIS, Horticultural and Viticultural Expert.

With the advance of spring, leaf-eating caterpillars and beetles will shortly commence preying on plants of all sorts, and for the destruction of these Paris green will have to be depended upon.

Previous experience in this as well as in the other States brings out the fact that large quantities of the Paris green sold to growers are spurious adulterations. The use of such Paris green is not only a waste of money, but is, besides, the cause of much loss of time and of crop. The growers, who, confident that they have done all that is necessary to check the noxious insects, feel satisfied that the poison will soon tell, and are alarmed when they discover, as some put it, "the grubs feed and do well on it."

I have already made an examination of several samples of Paris green bought in Perth, and find them more or less adulterated. In the interest of fruit growers and also of importers and dealers in Paris green, I would recommend that samples of the insecticide destined for the local market be submitted to the Department for analysis, and that a list of such dealers who have pure Paris green for sale be published in the JOURNAL of the Department of Agriculture for the information of their patrons.

A rough and ready test which will satisfy growers as to the purity, or otherwise, of the Paris green they have bought, is easily made by anyone. The test is as follows:—

In a test tube or a small beaker add a few drops of hydrochloric acid to a mixture of 10 to 20 grains of Paris green in water. If on heating the Paris green dissolves, it is pure.

If a residue of insoluble matter remains in the glass, it is most likely sand or Barium sulphate, a common form of adulteration.

Divide the solution into two parts. To part 1 add a few drops of Barium chloride; a white precipitate shows "sulphates," which may be sulphates of iron, of copper, of magnesia, of lime, or some other adulterant.

To part 2 add ammonia till the solution smells strongly of that substance, the precipitate of copper which first shows is dissolved in excess of ammonia, if some form of precipitate persists, it is either iron or alumina, two other forms of adulterants.

Should growers be satisfied from tests that their Paris green is adulterated, samples, if submitted to the Department, will receive attention.

In the article of the "Codlin Moth," published in this month's issue of the JOURNAL of the Department, a reliable form of arsenical preparation, known as Kedzie's method, is described.

PARIS EXHIBITION, 1900.

WINE AWARDS.

The Secretary of the Department of Agriculture has received a report from the Royal Commission on the Paris Exhibition, giving a list of the wine awards, and also some remarks of the British Juror on Western Australian wines, as follows :—

Silver Medals.

George Barrett Lennard, St. Leonards, Swan.
G. W. Logue, Swan.

Bronze Medals.

Cowan & Despeissis, Guildford.
Corinjah Vineyard Co., Toodyay.
Laufler & Co., Helena Vineyards, Darling Range.
F. & C. Piesse, Katanning.

Honourable Mention.

W. Demasson, Toodyay.
C. W. Ferguson, Houghton, Swan.
Kistner & Vaughan, Toodyay.
H. McGlew, Smith's Hill.
Waylen & Amherst, Darlington.

Report by Mr. W. Pheysey, British Juror in Class 60 : Wines.

"Western Australia has a small exhibit. On the whole, the wines, considering the age of the vineyards, show considerable promise. Those exhibited by Messrs. G. Barrett Lennard, G. W. Logue, F. & C. Piesse, and the Corinjah Vineyard Co. were the best. The first-named firm obtained the highest recommendation. I am of opinion Western Australia could make very fair wines, and I hope every encouragement may be given to develop the industry. In such a climate wine is a necessity of life, and, it is to be hoped, will be consumed by the colonists in preference to spirits. The way to bring about this most desirable result is to make palatable beverage wines. I would impress on the vignerons the absolute necessity of taking pains in the treatment of their wines, more especially during the first year after vintaging. Utensils, presses, press-houses and cellars must be kept scrupulously clean.

"I am pleased to see the efforts that the vineyard proprietors of the colony are already making, and I would urge them to avoid State interference as much as possible (politics and wine-making will not mix). The formation of central 'wineries' is an excellent idea, and should result in great economy of production and prevention of waste. Small owners, unless very skilful, do not succeed well: they would, therefore, profit greatly by selling the grapes to a central association, in which they would have a shareholder's interest, or not, as they pleased. A Government guarantee of interest on the capital expended, in forming such establishments, would help greatly, but I am not in favor even of that, as it might create a tendency on the part of the management to unduly consider

Government supporters, who might be vignerons, anxious to profit by the political influence they could bring to bear.

"I am not much in favour of dependence on chemical analysis of wines. My experience is that the good old-fashioned 'meters,' the nose and palate, are better guides to success in wine-making. I have seen elaborate certificates of the constituents of certain wines, proving their perfect condition, and yet on submitting them to the ultimate test—the palate of the consumer—they have been found to be particularly nasty.

"Any titles or descriptions suggestive of the Pharmacy are to be depreciated. The temptation to use such must be resisted, although I grant that the word 'ferruginous' is particularly helpful to the producer and distributor, and of great comfort to the consumer, but I would not advise reliance on such epithets.

"It is to be regretted that none of the older colonies exhibited their wines, as it would have been extremely interesting to have had the opportunity to see the progress that has been made since 1889."

GARDEN NOTES FOR OCTOBER.

BY PERCY G. WICKEN.

The past month having proved favorable for growing crops, all vegetables already planted should now be making good growth, and every effort should be made to get as much planting as possible done early in the month. A liberal supply of good, well rotted farmyard manure is essential to grow good vegetables. All kinds of farm and house refuse may be put into the compost heap and left until well rotted, and then dug into the ground. It is surprising what a large amount of refuse suitable for manure can be collected and saved around the ordinary farm buildings if sufficient care is only taken to gather it up. It will save, in the course of the year, an expenditure of several pounds for fertilisers. On the other hand, it must not be thought that manure is a remedy for all kinds of evil. Deep and thorough cultivation is, in many instances, just as necessary to produce good results as manuring, especially in the dry, hot weather, when the roots require to strike deeply into the ground to obtain a supply of moisture, and the surface requires to be kept fairly worked and thereby act as a mulch and stop the evaporation of water from the soil. A shallow worked and badly cultivated soil with a rough lumpy surface is not likely to give satisfactory results even if well supplied with manure. Weeds will now be troublesome, and must be kept cut down before they have an opportunity to seed. A look out will also have to be kept for cut worms and other insect pests, and steps taken to destroy them.

BEANS (French or Kidney).—Are a very valuable summer vegetable. They are very prolific, and, if properly looked after, and the beans pulled as soon as they are fit, will continue bearing for a long

period, but if the beans are allowed to mature they go out of bearing very quickly. They should be sown in drills 30 to 36 inches apart, and about 16 inches in the drills. A little Thomas' phosphate and sulphate of potash are the best manures to apply.

BEANS (Lima).—This is a most delicious bean of high nutritious qualities. The bean is eaten green, like green peas, or they may be dried and used as a haricot bean. There are both dwarf and climbing varieties. The Black Pole is one of the best climbing varieties. They deserve a great deal more attention from gardeners than they have yet received. Plant the same as French beans for the dwarf varieties, and the climbing varieties on a trellis.

BEANS (Madagascar).—Also called the Poor Man's bean. It is hardy, prolific, and a good climber; very useful for growing over a fence or outhouse. The whole pod is eaten the same as the French bean.

BEEF (Red).—A few rows may be sown so as to keep up a succession. Do not use fresh manure for the crop, as it causes the roots to become forked.

BEEF (Silver).—The leaf of this plant is used as a vegetable. They require to be heavily manured so as to induce the leaf growth.

CABBAGE.—Plant out any young plants now ready; they will probably require a little water when planted out to give them a start. Sow a small quantity in seed bed for future use.

CARROTS.—Sow a few hills to keep up a succession.

CUCUMBERS.—Sow a few drills to keep up the supply.

LETTUCE.—Plant out from the seed bed, and sow a little more seed. They require forcing along with liquid manure so as to make a quick growth.

MELONS (Rock, Water and Preserving).—Plant as many of these as you are likely to require. Do not plant the water and preserving melons near each other as they will cross fertilise and destroy the value of both varieties.

ONIONS.—Sow a little seed and keep those already growing well cultivated.

PARSNIPS.—Sow a few rows in deeply worked ground.

POTATOES.—If not already sown, plant out some of the quick growing varieties.

PEAS.—Will still do well in the cooler districts. Those sown now should come in in time for the Christmas market.

PUMPKINS AND SQUASHES.—Sow as many as possible, what you do not require can be stored for future use, they are valuable both for table and feed for stock. Plant in hills from 6ft. to 12ft. apart each way according as to whether they are bush or running varieties.

TOMATOES.—Plant out as many of this valuable plant as possible. Those planted early will require staking and tying up. Manure well and look out for the cut worms and other insects.

FARM.—This is a busy month on the farm, and as many of the summer crops as possible should be sown before the soil becomes

too dry. Melons, pumpkins, maize and potatoes should all be sown before the end of the month. Cow peas, sorghum, millets, mangels, bokhara clover, pigeon pea, soy beans, etc., may all be sown during the month. The warm weather will soon be here now with the usual number of bush fires, and means should be taken to guard against these by ploughing the necessary firebreaks, and clearing the rubbish away from the fences. Those who intend to turn their wheat crops into hay, should see that their binders and other implements are all in good order and ready to use when required.

ANSWERS TO CORRESPONDENTS.

Mr. Stewart Kernan, Glenbourne, writes :—" Can you tell me what is best to be done for the disease known as " Bleeding Nose," which attacks calves reared by hand. One person I know has lost twenty young calves in a few weeks, and I have had many die with it. In fact every calf that had it died. The symptoms vary. In some cases a calf to all appearances will be quite well at night, and in the morning, it is found all gathered together, eyes inflamed, hair rough and on end, and shivering violently, and in 24 hours a calf that was in good condition when fat, would have fallen away so much that its ribs could be easily counted, with its eyes terribly sunken. Generally it would linger through another day, then die. Just before death the blood would gush from both eyes and nose. In other cases I have noticed the calf looking rough haired with the skin of the neck very much wrinkled, and the whites of the eyes a pinkish colour. After a few days there would be a slight discharge of blood from the nose, yet the calf would still seem to be in apparently good health, eating and playing about for weeks. The discharge of blood from its nose would cease, and it would commence to pass blood, blisters shortly after appearing on the body, which would break, discharging blood, the discharge increasing, eyes swelling, the nose again commencing to bleed. It appears to be in great pain, moaning and bellowing until they drop dead. Some persons say it is not contagious, while others say to the contrary. Since it first came to my place I have never been free from it." The matter being referred to the Government Veterinary Surgeon, Mr. Weir replies :—" The disease referred to by Mr. Keenan in his letter amongst young calves appears to be " Influenza," a highly febrile and also contagious disease. The lungs and liver are the organs liable to attack, and the white of the eye turning a pinkish color, will be a pure indication the latter organ is more or less affected. In the early stage of disease a cure may be easily effected, but if delayed until bleeding from the nose takes place, then recovery is practically impossible. *Preventive treatment*—Keep the young animals in a well-ventilated, closed-in building, the flooring of which should be kept perfectly dry. When turned loose, place in a well-sheltered and dry paddock until the month of November, when liability to attack will have ceased. *Curative*—Isolate all affected animals, disinfect the premises, whitewash the walls, and place lime on the floor. Mustard applied to the throat and immediately behind the shoulders of the patients, a tablespoonful of Epsom salts, given daily for a few days, and Liq. Ammon. Acet., two (2) drams; Spts. of Nitros Aeth. one (1) dram, given night and morning in a little water."

Mr. R. A. Forsyth, Kojonup, writes :—" You will oblige if you can give me any remedy to make butter out of cream that goes to froth instead of coming to butter when churned. The cows are in an old cultivated paddock, in which several weeds grow. The worst is a weed with a blue flower. It is a low weed on the ground, and has a very bitter taste." The matter having been referred to the Dairy Expert, Mr. Crawford replies :—" It is a difficult thing to say exactly what is the cause of frothy cream, as it may arise from various reasons, among which are the following—(1.) Having the churn too full. (2.) Keeping the cream too long before it is churned. This is one of the most common

reasons. (3.) Cows being too long in milk and heavy in calf. (4.) Sometimes from what the cows eat. This can often be prevented by putting a little salt-petre into the bucket when milking each cow. It is, however, more likely to be one or other of the first two. (5.) Another reason may be having the cream too thick. In that case the best way is to add pure cold water and thin it down."

The Right Rev. Dr. Kelly, Bishop of Geraldton, writes:—"At the request of Mr. Peacock, of Whim Creek, I am sending you a specimen of a plant which grows plentifully in that locality. The plant is, no doubt, known to your botanist, but it has some peculiarities with which they may not be so familiar. Mr. Peacock describes it as a perfect death-trap for chickens. As they play or feed amongst it, it enmeshes them, lacing them around with its long tendrils as with so much twine, and holds them there until they are released or die of starvation. On the day of my arrival at Whim Creek Mr. Peacock rescued seven of his chickens from the plant, well-grown little birds of about a fortnight old. Sometimes, he informs me, as many as ten have been held captive at one time. He would like to have an opinion from the Departmental Experts on the subject. In the same box I am enclosing some seeds of a tree called by the natives of Beagle Bay 'Warra-marra,' and by those of Broome 'Nyooroongal.' The fruit resembles the wild olive in size, appearance, and purple color, but has a sweet taste. The tree is handsome and umbrageous, and grows on the sand, almost in the wash of the sea in some cases, and might be worth cultivating as an ornamental shade tree." The matter being referred to the Government Botanist, Dr. Morrison, replies:—"The plant is *Boerhaavia diffusa*, a native of all the Australian States, and of Polynesia and the warmer parts of Asia and Africa. It belongs to the natural order *Nyctaginaceae*, and probably, like other species of the same family, possesses medicinal qualities. More commonly the plant is not provided with hairs, but in the form sent by Bishop Kelly it is covered all over with erect jointed, rigid, or almost spiny hairs, of varying length, and to these it owes its faculty as chicken-catcher. The chicken is caught by these stiff hairs fixing themselves on its tender skin under the young feathers, and the more the bird struggles the more the flexible branches become wound round its body, and its escape becomes more hopeless. The seeds forwarded cannot be identified at present, but will be sent to Drakesbrook to be sown."

"Almond," Denmark River, writes:—"Early in July last I planted fully 70 almond trees from a N.S.W. Nursery. They looked rather dry after fumigation and were put in a trench till planted a few days later. Not a single one has shown signs of budding, while several are throwing out shoots just above the ground. In the majority the bark is dull and dry looking, while a few show the bark coming into a nice, fresh, green color. What is best to be done?" The matter being referred to the Horticultural and Viticultural Expert, Mr. Despeissis replies:—"Careless handling from the time the young trees were lifted from the nursery beds until they reached their destination would account for the stems drying up. Fumigation, as proved by the hundreds-of-thousands of trees treated every year, would not cause this drying up. Stacking in close proximity to steam pipes on board ship has often thus been known to hurt trees. The layering in damp ground for a few days was a wise course to follow to restore the trees to health, and a few of the trees which now show a green stem once again, have, I dare say, been much benefitted by that operation. The others are dead above ground and shoots are suckering from below the surface. These should be pulled or cut off, except one, which may be trained straight, and budded in a couple of month's time, or grafted early next spring, using for scion one of the improved soft-shell varieties. Of these, two in particular, Stewelling and Burbank, I would recommend for the Albany district. They blossom later than most other sorts, and are thus better suited for the cooler climate."

Mr. D. Wells, Wagerup, writes:—"What is the cause (and cure if any), of young ducks going in the legs, they seem to lose all strength in their legs and wobble about and topple over. Last year I lost several—they were running at liberty, and could go into water when they fancied. This year I have them

penned up, and let them out for half-an-hour to have a swim and then return them to their house. They have a fairly dry floor and rooted over. I also give them dry bedding regularly. After they are about two weeks old they are fed principally on oil cake and pollard, mixed, and wheat as they get older." The matter being referred to the Dairy Expert, Mr. Crawford replies: "It is difficult to say the cause, consequently the cure. It would be advisable not to allow them to water to swim, but confine them to their drinking water only. That should be so arranged that they cannot get into it to wet themselves. See that they have sharp grit."

MARKET REPORT.

FOR MONTH ENDING OCTOBER 10.

Messrs. A. Ballantyne and Co., produce merchants, City Markets, report sales in undermentioned lines for the month ending October 10:—

Dairy Produce.—Butter—Local supplies realising 1s 1d to 1s 2d per lb.; New South Wales and Queensland butter, 1s to 1s 1d per lb.—Bacon—Market keeps firm, best Victorian sides, 10½d per lb; middles, 11d per lb; flitches, 10d per lb. Hams—Prime quality, 11d to 11½d per lb. Cheese—Market quiet, only prime mild quality being saleable at 8d to 8½d per lb. Eggs—local selling freely, 1s 1d to 1s 2d per doz.; duck eggs, 1s 4d per doz.; imported eggs, scarce, 11½d to 1s per doz.

Farm Produce.—Chaff—Only prime quality in request, £4 to £4 10s per ton; special quality, £4 12s 6d per ton; several trucks good chaff were sold in Perth this month at 60s to 65s per ton at auction sales. Oats—The federal tariff has affected this line considerably; New Zealand Oats cannot now be landed under 4s per bushel. Wheat—4s 6d to 4s 8d per bushel. Bran—£6 15s per ton. Pollard—£6 17s 6d per ton. Potatoes—market dull, best Ballarat and New Zealand £9 10s per ton. Inferior lines £8 to £8 10s per ton. New local potatoes, £12 to £14 per ton. Flour—best imported £9 10s per ton. Prussian blue peas—6s per bushel. South Australian onions—£22 per ton. Californian onions—£23 per ton.

Fruit.—All classes of fruit very scarce, quite impossible to supply country orders to hand, until more imported fruit is procurable. Apples—only miserable dried samples offering, 17s to 20s per case; prime lines, worth 25s per case. Bananas—very scarce, worth 20s to 27s per case. Oranges—good quality, 14s to 14s 6d per case. Lemons—10s to 11s 6d per case. Cape Gooseberries—4d per lb. Loquats, 4½d per lb. Passion Fruit—12s to 15s per case. Strawberries—we have been appointed sole agents for the Darling Range Strawberry Growers' Association for the season. A keen demand exists for this fruit, all consignments forward have been promptly cleared at 1s 3d per lb.

Poultry.—Sales brisk for all prime birds forward. Table fowls—6s 6d to 7s 6d per pair. Ducks—7s 6d to 9s per pair. Turkeys—hens, 12s to 14s per pair; gobblers, 22s to 24s per pair.

Carcass Meat.—Prime porkers—6½d per lb; medium quality, 5d to 5½d per lb. Lambs—11s to 12s each. Frozen mutton—4½d per lb. Frozen beef—4d per lb. Frozen lambs—12s each. Veal—4½d per lb.

Pigs.—Several good lines forward this week. Stores—15s to 24s each. Slips—11s to 13s each. Suckers, 9s to 10s each. Prime porkers—30s to 33s each.

BACK NUMBER OF JOURNAL REQUIRED.

Any person having a copy or copies of the January issue, of this year, of the JOURNAL, will oblige by sending same in to the Editor, Department of Agriculture, Perth. Sixpence will be paid for each copy.

THE CLIMATE OF WESTERN AUSTRALIA DURING SEPTEMBER, 1901

The climatic conditions for September were, on the whole, fairly normal, with the following exceptions:—The weather was unusually cloudy in the S.W. coastal districts, where the night temperatures were considerably in excess of the means for previous years. The rainfall throughout the settled districts, between Geraldton and Esperance, was generally below the average. On the coast East of Esperance it was heavier than usual. Throughout the Coolgardie goldfields it was light and about the average, and from the Murchison northwards practically no rain fell at all, as usual at this time of the year.

The weather was very rough at sea to the southward during the first two or three weeks, but fine to moderate towards the end of the month. A sudden extension of a "low" northwards on the 7th gave the Coolgardie goldfields their first severe dust-storm of the season. A rather peculiar development occurred between the 18th and 20th. On the 18th the atmospheric pressure was fairly uniform and moderately high throughout the State. During the course of the day barometers fell generally, and on the morning of the 19th they were still fairly uniform, but considerably lower than 24 hours previously, with a shallow "low" inland south of Shark's Bay. This seemed then to develop stronger characteristics, and moved rapidly in a S.E. direction, and on the morning of the 20th appeared as a "low" of considerable energy between Esperance and Eucla, accompanied by a violent gale in S.E. districts. Next day it reached South Australia, bringing very unsettled weather to the southern portions of that State.

Hot weather appears to have fairly arrived in the tropics, where several stations recorded a maximum of over 100 degrees, and even at Geraldton the thermometer reached 92·1 degrees on the 30th. Frosts are now apparently over for the season. The mean and absolute minimum on the surface of the ground at a few places was as follows:—

Cue	...	...	...	43·7	...	34·9
Coolgardie	...	...	...	43·1	...	31·0
Southern Cross	...	...	...	39·9	...	29·1
York	...	...	...	39·4	...	31·4
Perth Observatory	...	...	...	47·7	...	34·4
Katanning	...	...	...	40·2	...	31·0
Bridgetown	...	...	...	38·6	...	31·5
Karridale	...	...	...	45·6	...	37·0

THE CLIMATE OF WESTERN AUSTRALIA DURING SEPTEMBER, 1901.—Continued.

Locality.	Barometer (corrected and reduced to sea level.)			Shade Temperature.						Average for Previous Years.				Rainfall.
	Mean. Aver- age of 9 a.m. Prev. and 8 p.m. years.			September 1901.										
	High- est.	Low- est.		Mean Max.	Mean Min.	Mean Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points Total (100 to points in Jan. 1.	
Norham	67.9	43.7	55.8	82.4	34.2	67.1	44.6	95.0	30.0	45	
York	68.1	50.3	59.2	83.0	41.0	—	—	—	—	54	
Guildford	67.7	52.5	60.1	80.2	41.7	68.8	49.4	89.0	35.0	191	
Perth Gardens	65.5	52.2	58.8	79.5	42.2	67.1	50.7	82.0	39.8	263	
Perth Observatory	64.3	54.6	59.4	81.0	43.0	65.4	51.1	84.0	39.0	3318	
Fremantle	64.9	55.0	60.0	77.4	40.6	65.8	50.7	80.0	40.0	275	
Rottnest	65.2	51.3	58.2	80.5	41.4	—	—	—	—	3408	
Mandurah	—	—	—	—	—	—	—	—	—	195	
Wandering	—	—	—	—	—	—	—	—	—	2589	
Collie	63.6	45.2	54.4	77.5	32.0	—	—	—	—	147	
Dardanup	—	—	—	—	—	—	—	—	—	233	
Bunbury	64.4	50.3	57.4	77.0	38.5	63.8	47.7	83.8	32.2	2802	
Busselton	64.4	49.5	57.0	75.8	40.5	—	—	—	—	138	
Bridgetown	63.7	45.1	54.4	79.0	33.0	—	—	—	—	1636	
Karridale	63.1	51.2	57.2	79.2	43.5	—	—	—	—	110	
Cape Leeuwin	62.1	54.2	58.2	69.6	48.8	64.0	48.4	82.5	31.5	259	
Katanning	63.9	45.3	54.6	77.1	33.5	63.4	54.2	79.5	43.8	259	
Albany	63.9	48.8	56.4	72.0	41.4	65.9	42.3	88.0	29.8	155	
Breaksea	61.1	51.2	56.2	69.5	44.8	61.4	48.3	81.4	34.0	99	
Esperance	67.7	50.0	58.8	85.2	40.2	62.0	51.2	80.0	42.0	343	
Palladonia	71.0	45.7	58.4	86.8	37.0	66.8	48.0	96.0	34.0	187	
Eyre	69.0	48.0	59.0	89.2	35.0	—	—	—	—	233	
	181	
	634	
	322	
	1019	

The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

THE OBSERVATORY, PERTH, 9th October, 1901.

W. E. COOKE. Government Astronomer.

RAINFALL for August, 1901 (completed as far as possible),
and for Sept. 1901 (principally from Telegraphic Reports).

STATIONS	Aug.		S. PT.		STATIONS.	Aug.		SEPT.	
	No. of points, 100 equals lin.	No. of wet days.	No. of points, 100 equals lin.	No. of wet days.		No. of points, 100 equals lin.	No. of wet days.	No. of points, 100 equals lin.	No. of wet days.
EAST KIMBERLEY:					N'TH-WEST Cont.				
Wyndham	Nil	..	4	1	Tambrey	..	..	..	..
6-Mile	..	..	22	1	Millstream	..	..	..	..
Carlton	..	..	..	..	Mallina	..	..	..	..
Denham	..	..	..	..	Whim Creek	.. Nil	.. Nil	..	..
Rosewood Downs	..	..	..	..	Cooyapooya	.. Nil	..	..	..
Argyle Downs	..	..	..	..	Woodbroke	..	..	..	..
Lisadell	..	..	..	..	Croydon	.. Nil	..	..	..
Turkey Creek	.. Nil	..	20	1	Balla Balla	.. Nil	.. Nil	..	..
Ord River	..	..	..	..	Roebourne	.. Nil	.. Nil	..	..
Plympton (S.M.)	..	..	..	..	Cossack	.. Nil	.. Nil	..	..
Hall's Creek	.. Nil	.. Nil	..	..	Fortescue	.. Nil	.. Nil	..	..
Flora Valley	..	..	..	..	Mardie	.. Nil	..	..	..
Ruby Creek	..	..	..	..	Mt. Stewart	.. Nil	..	..	..
Denison Downs	.. Nil	..	..	..	Chinginarra	.. Nil	..	..	..
WEST KIMBERLEY:					Peedamullah	..	..	..	..
Obagama	..	..	..	..	Onslow	.. Nil	.. 2	.. 1	..
Derby	.. Nil	.. Nil	..	..	Red Hill	..	..	..	..
Yeeda	.. Nil	..	..	..	Wagoola	.. Nil	..	..	..
Liveringa	.. Nil	..	..	..	Nanutarra	.. Nil	..	..	..
Mt. Anderson	..	..	..	..	Point Cloates	.. Nil	.. 22	.. 1	..
Leopold Downs	.. Nil	..	..	..	GASCOYNE:				
Fitzroy Crossing	.. Nil	.. 62	.. 1	..	Winning Pool	.. Nil	.. Nil	..	..
Quanbun	..	..	..	..	Towara	..	..	..	..
Broome	.. Nil	.. 10	.. 2	..	Woorkadjia	.. Nil	..	..	..
Thangoo	..	..	..	..	Mt. Augustus	.. Nil	..	..	..
La Grange Bay	.. Nil	.. 13	.. 2	..	Bangemall	.. Nil	..	..	..
NORTH-WEST:					Minnie Creek	.. Nil	..	..	..
Wallal	.. Nil	.. Nil	..	..	Yanyearddy	.. Nil	..	..	..
Condon	.. Nil	.. 5	.. 1	..	Williambury	.. Nil	..	..	..
DeGrey River	.. Nil	..	..	..	Carnarvon	.. 1	.. 1	.. 5	.. 1
Port Hedland	.. Nil	.. Nil	..	..	Dirk Hartog Is.	.. 133	.. 14	.. 34	.. 2
Boodarie	..	..	..	..	Mungarra	.. Nil	..	..	..
Yule River	..	..	..	..	Clifton Downs	.. Nil	..	..	..
Warralong	..	..	..	..	Tamala	..	..	..	..
Muccan	.. Nil	..	..	..	Sharks Bay	.. 51	.. 5	.. 10	.. 1
Etrick	..	..	..	..	Kararang	..	..	..	..
Eel Creek	..	..	..	..	Meedo	..	..	..	..
Coongon	..	..	..	..	Wooramel	.. 5	.. 2	.. 16	.. 2
Warrawagine	.. Nil	..	..	..	Hamelin Pool	.. 40	.. 7	.. 34	.. 1
Bamboo Creek	.. Nil	.. Nil	..	..	Byro	..	..	..	..
Marble Bar	.. Nil	.. Nil	..	..	Berringarra	.. Nil	..	..	..
Warrawoona	.. Nil	.. Nil	..	..	Mt. Gould	..	..	..	..
Corunna Downs	..	..	..	..	Peak Hill	.. Nil	..	.. 19	.. 1
Nullagine	.. Nil	.. Nil	..	..	Horseshoe	.. Nil	..	.. 3	.. 1
Yandicoogina	.. Nil	..	..	..	Abbotts	..	.. 2	.. 12	.. 1
Tambourah	.. Nil	.. Nil	..	..	Mileura	.. Nil	..	..	..
Kerdeadary	.. Nil	.. Nil	..	..	Manfred	.. Nil	..	..	..
Mulga Downs	.. Nil	..	..	..	Meelya	..	..	..	..
Woodstock	.. Nil	..	..	..	Woogorong	.. Nil	..	..	..
					Belele	..	..	..	..

RAINFALL.--Continued.

STATIONS.	AUG.		SEPT.		STATIONS.	AUG.		SEPT.	
	No. of points. 100 equals 1in.	No. of wet days.	No. of points. 100 equals 1in.	No. of wet days.		No. of points. 100 equals 1in.	No. of wet days.	No. of points. 100 equals 1in.	No. of wet days.
GASCOYNE--Cont.					S.W. Div.--Cont.				
Billabolong ..	..	..	..	..	Mundaring ..	638	16	341	13
Wooleane ..	Nil	..	..	..	Belvoir ..	396	11	220	14
Murgoo ..	Nil	..	..	..	Guildford ..	583	16	191	12
Meka ..	11	1	Nil	..	Kallyamba ..	616	13	208	15
Mt. Wittenoom ..	9	1	..	..	Canning W'works ..	661	13	332	13
Nannine ..	Nil	..	Nil	..	Perth Gardens ..	590	17	263	15
Star of the East ..	9	1	Nil	..	.. Observatory ..	605	18	275	16
Annean ..	..	..	..	..	Subiaco ..	638	16	225	16
Tuckanarra ..	43	3	8	2	Claremont ..	619	19	260	16
Coodardy ..	..	..	..	..	.. Richardson ..	539	13	219	11
Cue ..	22	2	Nil	..	Armadale ..	558	14	193	13
Day Dawn ..	30	2	Nil	..	Fremantle ..	496	17	195	19
Lake Austin ..	21	3	5	2	Rottneet ..	420	17	147	18
Lennonville ..	13	1	10	1	Rockingham ..	505	15	249	17
Mt. Magnet ..	3	1	11	1	Canning River ..	754	16	390	16
Challa ..	13	2	..	..	Jarrahdale ..	750	14	431	15
Youeragabbie ..	11	1	..	..	Mandurah ..	491	13	223	15
Murrum ..	..	..	..	..	Pinjarrah ..	633	14	324	14
Yalgoo ..	19	5	5	1	Harvey ..	585	19	377	17
Gullewa ..	77	7	16	2	SOUTH-WEST, CENTRAL PART (INLAND):				
SOUTH-WEST DIVISION (N'N PART):					Momberkine ..	259	11	69	7
Murchison House ..	309	13	33	4	Culham ..	322	11	64	7
Mt. View ..	356	14	..	..	Newcastle ..	334	12	87	5
Yuin ..	37	3	..	..	Eumalga ..	350	14	132	10
Northampton ..	579	13	43	3	Northam ..	239	11	45	7
Mt. Erin ..	510	13	74	6	Grass Valley ..	335	13	63	7
Oakabella ..	613	14	..	..	Meckering ..	350	12	..	..
Narra Tarra ..	505	11	56	2	Cunderdin ..	232	8	..	..
Tibbadden ..	514	12	129	5	Doongin ..	169	11	38	3
Sand Springs ..	446	14	..	..	Whitehaven ..	221	11	..	..
Mullewa ..	218	11	23	5	Sunset Hills ..	265	14	65	3
Boonetal ..	548	18	..	..	Cobham ..	245	14	64	11
Geraldton ..	596	15	32	7	York ..	253	14	54	7
Greenough ..	708	15	62	7	Beverley ..	246	16	42	4
Dongara ..	407	11	50	3	Barrington ..	227	13	..	..
Dongara (Pearse) ..	401	12	53	7	Sunning Hill ..	334	9	..	..
Strawberry ..	403	9	..	..	Wandering ..	444	16	138	13
Minginew ..	511	15	69	6	Pingelly ..	222	9	37	7
Rothsay ..	133	4	..	..	Marradong ..	429	25	209	11
Field's Find ..	68	6	8	2	Bannister ..	505	19	159	13
Carnamah ..	298	10	46	4	Narrogin ..	264	13	81	10
Watheroo ..	139	10	98	5	Wickepin ..	346	14	56	7
Dandaragan ..	419	16	160	7	SOUTH-WEST DIVISION (S'N PART):				
Moora ..	239	13	94	2	Bunbury ..	619	20	283	19
Yatheroo ..	417	14	206	10	Collie ..	582	22	265	18
Walebing ..	223	16	85	10	S.A. Settlement ..	590	22	267	17
New Norcia ..	261	16	96	7	Glen Mervyn ..	634	21	300	14
SOUTH-WEST DIVISION, CENTRAL (COASTAL):					Dardanup ..	584	17	258	14
Gingin ..	674	15	267	13	Donnybrook ..	639	18	306	8

RAINFALL.—Continued.

STATIONS.	AUG.		SEPT.		STATIONS.	AUG.		SEPT.	
	No. of points. 100 equals in.	No. of wet days.	No. of points. 100 equals in.	No. of wet days.		No. of points. 100 equals in.	No. of wet days.	No. of points. 100 equals in.	No. of wet days.
SOUTH-WEST—Cont.					EASTERN DIV.—Cont.				
Boyanup ..	630	19	281	17	Laverton ..	21	4	71	2
Busselton ..	565	25	110	19	Murrin Murrin ..	10	7	28	2
Quindalup ..	589	20	214	17	The Granites ..	23	1	45	2
Margaret River ..	638	15	270	11	Tampa ..	32	3	2	1
Lower Blackwood	625	20	..	..	Niagara ..	56	5	59	2
Karridale ..	993	20	259	23	Yerilla ..	33	2	56	2
Augusta ..	842	20	107	13	Menzies ..	50	5	35	2
Cape Leeuwin ..	737	25	155	26	Waverley ..	42	5	55	3
Biddellia ..	664	24	..	..	Goongarrie ..	26	4	59	2
The Warren ..	849	20	446	19	Mulwarrie ..	33	4	30	3
Lake Muir ..	439	23	266	20	Kurawa ..	68	9	91	3
Mordalup ..	386	21	..	..	Dixie Gold Mine	68	8	109	3
Deeside ..	431	18	262	18	Kurnalpi ..	48	9	151	3
Riverside ..	483	23	216	19	Bulong ..	89	9	156	4
Balbarup ..	541	20	206	15	Kanowna ..	78	9	97	5
Wilgarup ..	557	24	231	20	Kalgoorlie ..	112	8	120	6
Mandalup ..	536	19	288	16	Coolgardie ..	106	7	93	4
Bridgetown ..	538	20	212	21	Burbanks P. O. ..	92	7	73	..
Greenbushes ..	657	16	281	16	Burbanks (B. G.)	93	7	74	3
Williams ..	234	15	67	9	Woolubar ..	108	4	126	4
Arthur ..	290	16	110	11	Widgiemooltha ..	149	11	141	6
Darkan ..	273	10	..	..	50-Mile Tank ..	113	6	102	2
Wagin ..	221	15	106	11	Norseman ..	156	10	111	5
Glencove ..	305	15	108	11	Bulla Bulling ..	143	..	79	..
Dyiliabing ..	270	13	99	8	Woolgangie ..	148	5	58	4
Katanning ..	348	14	99	12	Boorabbin ..	138	7	72	5
Kojonup ..	357	12	110	10	Karalee ..	112	8	44	4
Broomehill ..	216	16	130	10	Yellowline ..	123	..	60	..
Sunnyside ..	256	18	109	11	Southern Cross ..	189	11	49	4
Woodyarrup ..	252	15	76	13	Mount Jackson ..	119	9	45	3
Cranbrook ..	297	15	123	12	Bodallin ..	168	15	..	..
Blackwattle ..	361	11	..	..	Burracoppin ..	176	7	43	2
Mt. Barker ..	344	12	198	13	Kellerberrin ..	146	12	36	5
Kendenup ..	392	10	225	15	Mangowine ..	125	..	..	..
St. Werburgh's...	353	19	..	..	Waltoning ..	144	7	..	..
Forest Hill ..	425	24	258	23	EUCALYPTUS DIVISION:				
Denmark ..	648	21	347	16	Ravensthorpe ..	367	9	139	5
Albany ..	475	20	323	20	Coconarup ..	376	12	..	..
Point King ..	528	22	358	21	Hopetoun ..	358	14	227	13
Breaksea ..	359	17	187	18	Fanny's Cove ..	369	11	..	..
Cape Riche ..	330	12	..	..	Park Farm ..	477	14	263	14
Pallinup ..	226	14	..	..	Esperance ..	351	16	233	16
Bremer Bay ..	397	14	140	9	Gibson's Soak ..	313	9	174	10
EASTERN DIVISION:					Swan Lagoon ..	244	18	..	..
Lake Way ..	6	2	..	..	Grass Patch ..	477	11	149	11
Mt. Sir Samuel ..	27	2	Nil	..	Bayatop ..	282	6	158	8
Lawlers ..	18	5	6	1	Israelite Bay ..	213	11	203	6
Diorite King ..	15	3	..	..	Frazer Range ..	116	5	..	..
Mt. Leonora ..	16	3	10	1	Balladonia ..	125	8	181	..
Mt. Malcolm ..	4	2	30	1	Eyre ..	220	8	322	11
Mt. Morgan ..	7	2	55	3	Eucala ..	194	9	175	6

The Observatory, Perth, October 8, 1901

W. E. COOKE, Govt. Astronomer.

RETURN OF FRUIT IMPORTED INTO WESTERN AUSTRALIA DURING SEPTEMBER, 1901.

NAME OF PORT	No. of Ships.	No. of Consign- ments Inspected.	Total No. of Cases.	No. of Cases Passed.	No. of Cases Prohibited.	No. of Cases Destroyed.	No. of Cases in Quarantine.	No. of Cases Dipped.	No. of Cases of												
									Apples.	Apricots.	Bananas.	Cherries.	Gooseberries.	Lemons.	Nectarines.	Oranges.	Passion Fruit.	Pears.	Plums.	Rhubarb.	Strawberries.
FREMANTLE	18	93	11,720	99,573	2197	2197	...	11,850	8381	1715	...	...	...	432	2932	74	10	...	...	...	...
ALBANY	6	6	301	349	22	22	...	391	178	21	...	...	...	21	187	11	...	...	...	...	...
GERALDTON	2	2	8	8	...	...	...	8	...	...	...	...	...	...	...	...	...	...	...	8	...
HAYELIN	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
BUSSETTON	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
BUNBURY	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
ESPERANCE	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
TOTAL	26	101	11949	9730	2219	2219	...	11949	3769	1766	...	...	...	653	3008	365	10	...	...	37	50
																				1	

DEPARTMENT OF AGRICULTURE,

2nd October, 1901.

RETURN OF FRUIT TREES AND PLANTS IMPORTED INTO WESTERN AUSTRALIA DURING SEPTEMBER, 1901.

NAME OF PORT.	No. of Ships.	No. of Consign- ments of Trees or Plants.	Total No. of Trees or Plants in such Consignments.	No. of Consig- ments Passed.	Total No. of Trees or Plants in such Consignments.	No. of Consign- ments of Trees or Plants Prohibited.	Total No. of Trees or Plants in such Consignments.	No. of Packages Shipped.	(Ornamental & Pot Plants.	Almonds.	Apples.	Apricots.	Cherries.	Figs.	Lemons.	Limes.	Mulberries.	Oranges.	Peaches.	Pears.	Plums.	Small Fruits.	Vine Cuttings.	All Other Trees
FREMANTLE ..	5	9	2720	9	2720	..	2720	20	420	..	..	..	..	..	..	..	..	1750	..	..	..	550	..	..
ALBANY ..	3	3	262	2	212	1	50	3	81	..	96	2	..	10	..	..	..	..	..	3	15	3	..	..
GERALDTON ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
HAMELIN ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
BUSSELTON ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
BUNBURY ..	2	2	1027	2	1027	..	..	14	27	..	..	..	..	..	..	..	..	..	..	..	..	1000	..	..
ESPERANCE ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
TOTAL ..	10	14	409	13	959	1	50	37	528	..	96	2	..	10	1750	3	15	3	1550	..	2

DEPARTMENT OF AGRICULTURE,
2nd October, 1901.



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1901.



NOTES.

MANUFACTURE OF LACTIC FERMENT.—Dr. W. T. Connell, bacteriologist, connected with the Kingston Dairy School, Canada, has been engaged for some time manufacturing lactic ferment used in connection with cheese making, to regulate fermentation, remove gasiness, and make the cheese close and compact. Last year not more than one dozen bottles were sent out, but this season, so far, over 100 bottles have been distributed.

KEEPING COWS CLEAN.—The cleaning of cows by using the brush and currycomb on them, as well as giving them a scrubbing and rinsing with a sprayer, may appear as a waste of labour to those who have never tried the plan, but if cows were so treated the result would be more milk and butter, as the cows would be more comfortable. It is more important to brush cows than horses, as the dirt from cows easily finds its way into the milk.

DRIED BLOOD FOR STOCK.—Farmers who kill their own sheep should, according to Professor Hemy ("Feeds and Feeding") dry the blood and give it to the stock, especially pigs. More so is this the case if corn is used, as this grain lacks protein, and the blood is very rich in it. It increases the value of the manure also, as none of its manurial content is destroyed by feeding to animals. As is well known, blood is a splendid manure. With pigs, a tablespoonful daily is enough to give at weaning-time. Gradually increase until 2oz. daily are given.

A DEAL IN APPLES.—An advice from Chicago, dated August 23, reads as follows:—"What is said to be the largest apple deal on record in the United States was made yesterday in the sale of the Haseltine apple crop in Green County, Missouri, for \$54,000 (£11,250). The sale includes the apples on 1,000 acres of orchard, which are estimated to harvest 100,000 barrels. Four produce firms are the purchasers of the crop.

FOOT AND MOUTH DISEASE CURE.—A remedy for the very fatal foot and mouth disease of sheep is being tested in France. It is a 53 per cent. solution of chromic acid, chemically pure, which is applied as a caustic to the sore, and gives a rapid and certain cure. Dr. Jarre, the discoverer, claims to have used the remedy with success in 1,500 cases in two years.

SOIL ANALYSES.—Many farmers hold erroneous ideas as to the value of soil analyses. We hear farmers speaking as though they only required to have the soil analysed to know what manures to apply to certain crops to obtain the best returns. This, however, is far from being so. In the first case, as every farmer knows, it would be nearly impossible to obtain a sample that would fairly

represent even a ten-acre field. Besides this an analysis will only show what the soil contains; it will not tell the farmer whether the plant food is in such a condition that the plants can make use of it, neither will it tell him what treatment the soil requires to make that plant food available. So many other things, such as the physical condition of the soil and sub-soil, its ability to retain moisture or perhaps the reverse, that (except to the scientist) a soil analysis is just as likely as not to prove misleading in dealing with the manures such a soil requires. The only guide to the farmer is experience. Find out what others have done under similar conditions, and prove by experiment whether the treatment beneficial in their case is equally so in yours. —*S.A. Journal of Agriculture.*

DEEP v. SHALLOW PLANTING.—Deep sowing and deep planting have many advocates, and sometimes they point triumphantly to the fact that the young plant has developed two distinct set of roots—one set deeply down, proceeding from the seed, and another set produced from a thin stem which had managed to reach the surface, the latter being close to the surface. If the lowest set of roots were carefully examined it would be found that they were weak and useless, and the stem between them and the upper set of roots had simply served to save the life of the plant until its leaves could get into the light and air. Undoubtedly until the second lot of roots has been developed the plant has been struggling for bare existence, and its progress has been seriously checked.

INTERESTING INTERVIEW.—Mr. Wm. Sandover, of the firm of Sandover & Co., Perth, who has recently travelled through America, was interviewed in London by a representative of the *British Australasian*, from which we take the following extracts. In speaking to the reporter, Mr. Sandover said:—"I went to the United States partly on business, partly on pleasure, and partly to get any information and new ideas which might be of use to my colony (or State, as it is called now) of Western Australia. This is my third visit to America, and each time I return I feel that Australians can learn so much from Americans in matters agricultural and industrial, for if Australia is to increase its population by millions, as it ought, it must turn its attention to making agriculture pay, and to encouraging manufactures. The mines first attract the people, but there must be other stable industries to keep those people in the State. When I visited Chicago I went through much of the wheat country. It would surprise my fellow-Western Australians to know that the State of Kansas, which a few years ago was practically uncultivated, will produce this year a crop of wheat which in pounds sterling amounts to more in value than the gold export from Western Australia for this year. It is estimated for 1901 at 100,000,000 bushels, which, at 2s. per bushel, will amount to ten million pounds sterling (£10,000,000). This will mean a return to the farmers of Kansas of, at least, £2 per acre. The yield per acre averages about 20 bushels, but in parts where the land is particularly rich it mounts up to 50 bushels per acre. Nearly all the

farmers of Kansas State have paid off their debts, and are now, it is said, 'purchasing the luxuries of the rich.' I was told that much of the success was due to the use of manures, to careful farming, and to the use of the latest labour-saving machinery. And these three points I want to bring to the attention of the farmers of Western Australia. In Western Australia only a few farmers have commenced using seed-drills instead of broadcast seed sowing. In Kansas everyone uses drills now; the broadcast seed-sowers have all been thrown on the scrap-heap. By using seed-drills and phosphates the crops can be almost doubled. While travelling through this farm country I was shown some very interesting figures. Forty years ago, to produce one bushel of wheat from beginning to end required three hours' labour. Now it only takes ten minutes. The cost of the human labour to produce this bushel was 1s. 6d. then. Now it is under 1³/₄d. A ton of hay forty years ago, cut with a scythe and gathered in by hand-rakes, required 35¹/₂ hours of human labour. To-day, with horse-mowers, horse-rakes, and horse-presses, it only takes 11¹/₂ hours of human labour, and the cost of labour per ton of hay has fallen from 12s. 3d. to 5s. 6d. Agricultural labour is expensive in America, so they invented machinery. Agricultural labour is more expensive in Australia, so that is the greater reason for farmers there to adopt machinery. It will help the labourers too, for more land will be cultivated, and many of them will be able themselves to acquire and work farms. I was also surprised to see the number of windmills in use in the farming States of America. At one manufactory that I visited they sold 18,000 last year. This year, with increased plant, they are making and will sell 34,000 windmills. American windmills are now sent to Western Australia in fair quantities; but every farmer there should feel the necessity of having at least one windmill, if not more."

SHROPSHIRE SHEEP.—As Shropshire sheep are coming so rapidly to the front as a farmer's sheep, not only in the Eastern States, but in this one, the following letter, taken from the *Live Stock Journal* may be of interest:—"It will without doubt interest breeders of Shropshire sheep in all parts of the world to learn that at the recent public sales held in various parts of Great Britain and Ireland no less than nine rams have realised 100gs. and upwards, and have made the splendid average of £136 10s., whilst several others have made between 40 and 90gs., and that several ewes have realised between 20 and 30gs. each. North America, as usual, has largely helped the general run of prices, but Australasian breeders have done the most to enhance values, and have been spirited bidders at several of the sales, giving in one case 240gs. for a ram, and in others 145, 140, and 90gs. The Australian demand has been greatly fostered by the wonderful results obtained by the Shropshire ram on cross-bred merino ewes to produce fat lambs for export. Mr. G. S. Kempe, a well-known Australian authority, says Shropshire cross lambs are now to be seen in every farmer's paddock, and that the breed has secured a very strong foothold in Australia."

THE INSECTIVOROUS BIRDS OF WESTERN AUSTRALIA.

BY ROBERT HALL.

BUFF-BELLIED SHRIKE-THRUSH (Grey Thrush).

Collyriocincla Rufiventris; *Gld* (*Ka-lir'i-osing-kla, ru-fi-vent'ris*).

Collurion, a thrush; *kighlos*, a bird; *rufus*, red; *venter*, abdomen.

Collyriocincla rufiventris, Gould, "Birds of Australia," fol., vol. ii., pl. 75.
"Key to the Birds of Australia." Hall, p. 11 (1899).

GEOGRAPHICAL DISTRIBUTION—AREAS, 9, 8, 7.

KEY TO THE SPECIES.—General appearance grey, under tail coverts bright fawn buff; back, ashy brown like nest of upper surface; bill, blackish; female has a distinct rufous eyebrow; second primary longer than secondaries.

Just as *C. harmonica* is the common thrush of Queensland, New South Wales, and Victoria, so is this species well known to us as the Western representative of the genus of nine species, of which we have three. My experience with our form so exactly agrees with what I have observed in the Eastern bird, that I feel safe to quote for this as I did for that regarding its habits. The Grey Thrush stays close to well-watered lands during the summer, and with the autumn its notes are heard near the towns. The generic name (*Collyriocincla*) has been applied to mean Thrush, or possibly, with a second construction, "a particular kind of bird that has one note distinctly and boldly given." But it has a rich, sweet voice as well, and for that reason it earned in past times the name of harmonica. If, while you are in the bush, you hear a rustling noise among the light branches of the timber, you will in all probability be safe to assign the cause to the Grey Thrush, as the effect is so different to that caused by small birds in the scrubby creek land. It is heavy footed, and seems careless. The size and awkwardness appear out of place amongst the quiet of the matted vegetation of a gully.

I once heard a naturalist say he hunted high and low for small worms and insects in certain gullies, and was unsuccessful, thanks to the Thrush, for it is the police bird of these same gullies, keeping in subjection the snails and other vermin that quickly disturb the balance of Nature when opportunity arises. The watchfulness of the bird applies as well to hundred of hillsides upon which fruit-trees have in recent years been planted. This creek-loving species is at all times to be observed. It has a varied taste, and any creeping thing does not come amiss. It tugs away at a cluster of woven leaves till the hidden spider's nest or that of certain caterpillars is dissected; or it carefully pries into any suspicious looking corner that is likely to harbour a good sized beetle. Among many curious forms a young lizard, in good order, and in length 2in., I drew from the gizzard—it evidently had been a late find. A species, closely allied, but comparatively rare, is *C. parvula*, *Gld.*, the little Shrike-Thrush.

Nest.—Cup-shaped and deep; composed of bark and fibres, and placed among twining plants, or in the hollow of a tree-sprout, or even in the bole.

Eggs.—Four to a sitting; ground colour, clear white, with spots of chestnutty-brown and bluish-grey upon them. The spots and blotches may vary considerably in their density and their disposition. Length, 1.1 in.; breadth, 0.85 in.

CHESTNUT-BACKED BABBLING THRUSH (Ground Thrush,
Ground Dove).

Cinclosoma castanonotum, Gld. (*Sing-klö-so'ma Kas-tan-o-no'tum*).

Kighlos, a bird; *soma*, a body; *Castanea*, chestnut; *Noton*, back.

Cinclosoma castanonotus, Gould, "Birds of Australia," fol., vol. iv., p. 5.

Key to the "Birds of Australia," Hall, p. 27 (1899).

GEOGRAPHICAL DISTRIBUTION.—ARCUS 9, 7, 6.

KEY TO THE SPECIES—

Adult Male.—Crown of head, back of neck, upper part of back, upper tail coverts, and two central tail feathers, brown; stripe over eye and another from base of lower mandible down side of neck, white; scapulars and lower part of back, rich chestnut; shoulders and wing coverts black, each feather with white spot at tip; chin, throat, and centre of breast, steel black.

Female.—Plumage much lighter, only a tinge of chestnut on rump; chin, throat, and breast gray instead of black.

Of the five known species of the genus three are found in our State. No one should be said to be common anywhere. At all times the bird is shy, and keeps to scrubby timber. It performs a similar service to mankind that the Ground-lark (*Pipit*) does on the adjacent open, and the Plover on the common beyond. All feed on terrestrial insects, and help to maintain the balance of Nature. This species associates in small flocks, or in pairs upon the ground, in the vicinity of gravel beds, where present. When it rises for flight the course is an undulatory one. In April, little flocks are seen—some 15 to 20 birds assembled. It is much more difficult to secure than a Quail. If a species of the latter rises it does so near you, and the experienced gunner kills the bird; but the Thrush, which flies also quickly, with a burr, rises so far ahead that a shot, fired otherwise than at random, serves only the purpose of frightening other birds, and disturbing the general peace. The nest is placed upon the ground, and the complement of eggs is two. In October I have found them with the assistance of the sitting bird. It will leave the nest as you approach, feigning a broken wing, as adopted by many other ground birds, including the European Lapwing. The White-fronted Chat is a well-known Australian example.

A second species is *C. cinnamomeum*, Gld., Cinnamon Babbling Thrush, found in the Eastern dry parts. The whole of upper face, scapulars, central two tail feathers, and flanks are cinnamon-brown; total length, 7.5 inches.

The third species, found in the North-West, and no other part of the Continent, is *C. marginatum*, Sharpe, the Northern or Black-

vented Babbling Thrush. The under tail coverts are black, margined with white, and washed with brown near base.



CHESNUT-RACKED BABBLING THRUSH (Ground Thrush, Ground Dove).

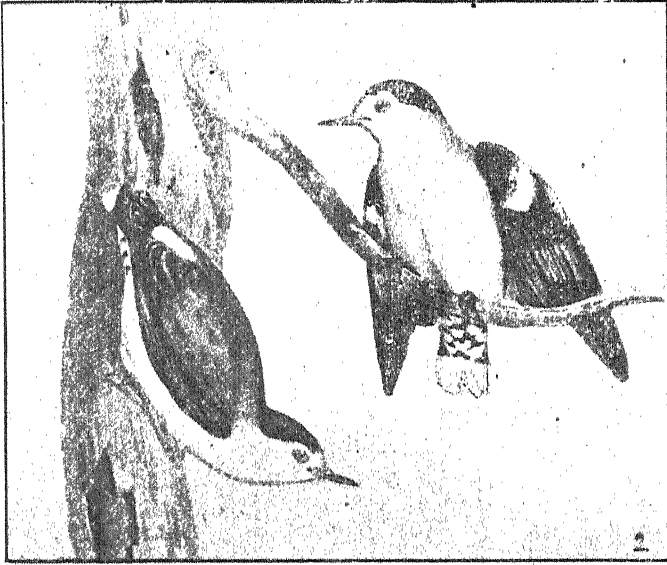
Nest.—Placed upon the ground, mostly in a slight depression. It is cup-shaped and made of grass.

Eggs.—Two or three for a sitting; white, with large olive-brown marks upon them, varying in intensity, and some appearing as if beneath the surface of the shell. Length 1·3 inches, breadth 1 inch.

TREE-RUNNERS AND CREEPERS.

We have no true wood-peckers. They are not to be found in the Continent, and the nearest representatives do not drill holes in the living timber and hide nuts in them. Our creepers are often called wood-peckers, but this is a term quite misapplied; all they do towards earning the title is to use the hollows made by fungi or other means, for nesting purposes, and to poke about the bark for

a meal. The distinction here drawn between runners and creepers is more a distinguishing application of their common names than for any other purpose. The runners creep along trees downwards, the creepers do so upwards. This almost invariably serves as an index to identify the two genera when on a tree.



BLACK-CAPPED TREE-RUNNER.

Sittella pileata, Gld. (*Si-tel'a pil-ä-a'ta*).

Sittle, a kind of wood-pecker (*sittella*, diminutive) *pileata*, capped.

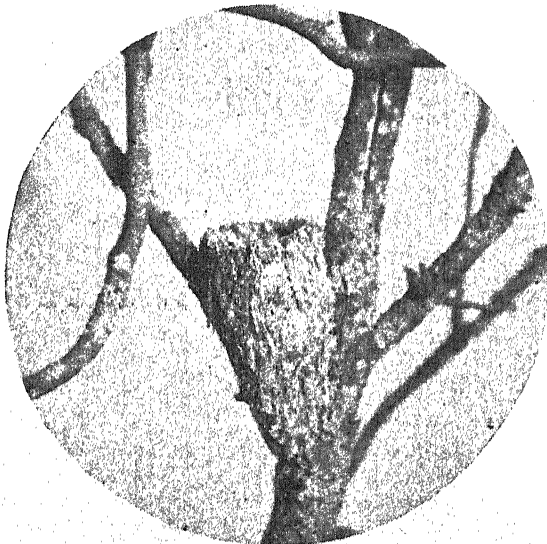
Sittella pileata, Gould "Birds of Australia," vol. iv., pl. 104; "Key to the Birds of Australia," Hall, p. 36 (1899).

KEY TO THE SPECIES.—Middle third of wing quills forming large rusty red patch, breast and abdomen white without any streaks; all upper part of head in female is black, the male having a black cap only, with white at base of bill and over eyes; bill nearly straight, slightly curved upwards; nostrils with a cutaneous valve and in a coriaceous groove.

Two of the six species are found in our State, one in the North and the other in the South, Central, and North-West. The tree-runners go in flocks of about eight; fly heavily when pressed for time, and appear more like solid bodies in flight than light bird forms. One may notice them in dry-wooded country just as in damp forest lands, though not so frequently in the latter.

The habits of this species appear to mean practically the same as those of the Orange-winged Tree-runner in South Australia. I quote an experience I once had with it. My friends and I sat quietly, and became interested in a grub that lay in the *Sittella's* mouth. We were inquisitive enough to know whether the old bird

had any objection to our looking on at the anticipated feeding of the young. We were not kept waiting long for the information, but we were for the results. Ten minutes or more that bird continued to fly from bough to bough, and finally decided to creep down the main stem to a crevice in the bark where was carefully hidden a young and fully fledged bird, temporarily secreted. It was fed, and one of us took hold of it. What followed may be easily anticipated. There was an uproar by the young bird, followed by three old birds, and all became as tame as Fan-tails. The graceful flying and nearness of their repeated approaches astonished us, even to showing an inclination to rest upon our hands, just with that instinctive feeling that tells one exactly when to retire for safety sake. These delicate advances on the part of three adult birds instead of two were followed by three more of the same species joining the group, but keeping at a distance. These latter were young birds. The adult *Sittella* rested in the air with a full expansion of the golden-coloured wings, as if for the time from their wild habits tamed. For many moments they perched within a few inches of the hand that held the young. The whole scene now was one of blended animation, timber, and birds, with the flying forms passing between and over the four members who constituted our party. The birds soon sought the higher branches, and we faced the ascent of a steep and rugged hill.



NEST OF A TREE RUNNER.

Nest.—A clear case of mimicry of surroundings; small, rounded, and fitted in an upright prong to assimilate in form and colour with the fork; made of downy portions of grasses, etc., and completely surrounded with spiders' webs, lichens, and bark; inner lining made of mosses.

Eggs.—Generally three to clutch, sometimes four; ground colour, bluish-white; spotted and blotched all over with slaty colouring. Length, 0·6 inch; breadth, 0·5 inch.

WHITE-WINGED TREE-RUNNER.

Sittella leucoptero, Gld. (*Si-tel'a lu-cop'te-rü*).

Sittle, a kind of Wood-pecker (*sittella diminutive*); *leukos*, white, *pteron*, a wing.

Sittella leucoptera, Gould, "Birds of Australia," fol., vol. iv., pl. 103.

"Key to the Birds of Australia," p. 36 (1899).

GEOGRAPHICAL DISTRIBUTION.—Areas, 81.

KEY TO THE SPECIES.—Middle third of wing quills pure white; head above, black; breast and abdomen white, without streaks; bill almost straight, slightly curved upwards; nostrils with a cutaneous valve, and with a coriaceous groove. Total length, 4 inches.

The *Sittella* active little birds with weak piping voices—are generally to be seen in little flocks of about eight to twelve, or even as many as two dozen. They delight themselves in a paddock of dying timber, where, in the season, they find their nest perfectly protected under the law of mimicry; being made of grey or brown bark, and placed in the fork of a grey or brown tree, they may well rest content. Still there is a way of finding the nest, though the present writer is, by duty bound, unwilling to divulge the secret to the many boys who read our *Gazette*. Should they learn to be successful, the beauty of the bird and nest will, I hope, keep their hands from cruel and unmanly acts. Birds [except poultry] are the rightful owners of eggs, not boys. The most Southern limit of this species is scarcely known. Hitherto it has been recognised as a bird found along the Fitzroy River.

Nest and Eggs.—At the present moment we are without a knowledge of them; quite unknown to us.

RUFIOUS TREE-CREEPER.

Climacteris rufa, Gld. (*Kli-mak'te-ris ru'fa*).

Klimakter, a step of a ladder; *rufus*, red.

Climacteris rufa, Gould, "Birds of Australia," fol., vol. iv., pl. 94. "Key to the Birds of Australia," Hall, p. 35 (1899).

GEOGRAPHICAL DISTRIBUTION.—Areas 9, 8.

KEY TO SPECIES.—General appearance rufous; fawn coloured band across wing; mantle brown; central pair of tail feathers, lower back and upper tail coverts olive-brown; under surface rusty-red; flanks without stripes; tail square, soft, and shorter than wing; one plate on tarsus. Total length, 6 inches.

Just as certain groups of plants are to be found in our Continent, and nowhere else, so it is with several of our birds. The genus *Climacteris* is one of them. In the search for food this portion displays a manner not adopted by any others in our country.

Commencing near the bottom of a large trunk, it ascends in a spiral course by a series of short jumps.

Looking at it for a few moments, you will gradually see it disappear on the other side of the tree trunk, to re-appear, in a

few seconds, on the same side as previously, but higher up. In the search for insects, this staircase movement goes on till the bird has ascended well into the branching forks. From there it flutters down to the base of another tree, and repeats its previous performance. Insects, to elude the diligent search of the bird, must be very well hidden, but I feel sure many an insect that is not exactly in this "corkscrew" course escapes for the time being. Such insects afford an opportunity for the Tree-runners (*Sittellæ*), as they come and work the trunk downwards, in contradistinction to the Tree-creepers. Such a case I have observed, but it is by no means a rule for one species to oblige the other in this way. The cry of this creeper is shrill and piping, and quite unlike that of the other birds with which it is found associating.

Nest.—At the bottom of the shallow hollow of a tree branch; grasses without, and feathers within.

Eggs.—Three to the sitting; salmon tinted, with spots of reddish-brown. Length, 1in.; breadth, 0.75in.



BLACK-TAILED TREE-CREEPER.

In addition to the common species just described, we have two rarer forms. One with a white brow, whose habitat is in the

Eastern portion of the State (collected at Kalgoorlie); and a second, with a black tail, which is found along the Fitzroy River, in the North. The former bird has been but recently described under the name *Olimacteris superciliosa*, North. A coloured figure is given in the report of the Horn Expedition into Central Australia, Zoology. The accompanying photograph, from John Gould's work, illustrates the black-tailed species (*O. melanura*, *Gld.*), as illustrated above. The Tree-creeper is one of those birds that rarely drink, and, excepting the Chestnut-eared Finch and Mallee Fowl, I would scarcely believe there is another that needs less moisture. All the members of the genus *Olimacteris* have a very prying nature; poking into logs, investigating spouts, and occasionally hunting amongst a small pile of fallen timber in search of insects. All have the same easy grace in gliding flight, as well as the grotesque positions while hopping amongst the ant-eater's logs upon the ground.

BRANDY DISTILLATION IN WESTERN AUSTRALIA.

A. DESPEISSIS.

Several inquiries have of late been made to me regarding the probable profits to be derived from the distillation of brandy in Western Australia, and in the following notes I have assumed that a vineyard established for that purpose be located on a stretch of deep, free, and moist soil, such as is commonly met with in the belt of country running along the coast of Western Australia, from the latitude of Perth and Fremantle to Cape Naturaliste to the Southward. My calculations are based on average figures. The cost of clearing may in some localities exceed that given in these notes, while in others it is sometimes under that estimated. Considerable fluctuations also occur in the yield of vineyards, but all those who are familiar with the heavy producing grapes from which wine is made for the purpose of distilling brandy will recognise that my valuation is very reasonable. Indeed, along the stretch of Tuart gum country which runs parallel with the coastal line of Western Australia many isolated vineyards occur, which for many years have yielded annually five to eight tons of grapes to the acre. That our Tuart gum country is destined to be one of the most profitable belts of vineland in Australia the results achieved give us every reason to believe.

Before discussing the profits to be made in this country in distilling brandy, it is necessary to review some of the facts on which the following estimates have been based.

IMPORT OF SPIRITS.

These returns have been taken from the "Blue Book," and show that the amount of spirit imported is rapidly increasing. The population of the State was in—

1894	...	...	...	...	82,072
1895	...	...	...	...	101,235
1896	...	...	...	...	137,946
1897	...	...	...	...	161,924
1898	...	...	...	...	162,129
1899	...	...	...	...	171,032

The male population, from which the spirit consumers are chiefly counted, constitutes about one-half of the general population.

The table below gives in detail the quantity and the value of ardent spirit imported during the last three years.

	1898.		1899.		1900.	
	Gals.	£	Gals.	£	Gals.	£
Brandy	39,309	23,094	31,550	20,204	39,993	28,414
Geneva and Schnapps	13,812	4,365	13,400	3,953	31,409	8,881
Gin	11,603	2,725	9,438	2,257		
Rum	13,026	2,318	9,631	1,671	14,447	2,641
Whisky	166,917	68,200	146,745	60,032	184,583	83,515
Liqueurs	2,108	2,061	1,652	1,552	2,075	1,837
Spirits of Wine (rectified)	4,700	389	2,661	218	1,088	223
Methylated	260	25	8,900	638	10,440	879

These returns bring the average price of brandy in bond close on 10s. to 12s. a gallon, and of whisky between 8s. and 9s., while they show that the consumption of ardent spirit in Western Australia is over 1·5 gallons per head of the population.

Genuine brandy, even of ordinary grade, and newly distilled, it is a well-known fact cannot be purchased either at Cognac, Bordeaux, or Marseilles, the three centres of the brandy trade, for less than 6s. a gallon, while the superior grades are quoted at a higher price, and yet at the present time so-called "brandy" can be purchased in bond at Fremantle for 5s. a gallon.

The extensive manufacture of pure Australian brandy, at a reasonable price, has of late done much in Victoria and South Australia to limit the importation of adulterated spirits and check illicit distillations.

The manufacture of Australian brandy is, however, susceptible of vast improvements, and although it is mostly made of "pricked" or unmarketable wine, bought for the purpose at a greatly reduced price, still, by means of careful distillation and proper maturing, three or four of the leading brandy manufacturing firms of the

Eastern States have lifted it up, in the face of unreasonable prejudice, to the level of the best brands of French brandy. The trade is a rapidly increasing and profitable one, and the Army Commissariat, recognising its merit, now puts it on a par on its tender list with the best brands of French Cognac placed on the market.

RELATION OF RAW MATERIAL TO MANUFACTURED BRANDY.

The production of brandy at per acre of grape vines varies with two or three factors, which it is well to bear in mind in making an estimate of the cost of manufacturing the brandy. These factors affect mainly the cost of the raw material used for distillation.

The same kind of grapes will yield differently when grown in a dry, arid locality, or in a moister one. The class of soil will also affect the crops. Varieties of grapes also differ very widely as regards quantity of grapes, quality of wine, and its suitability for the purpose of brandy making.

In this estimate I will consider for that purpose one of the most favoured localities for vine-growing in this State, and, for that matter, in the whole of Australia.

The coastal zone of the South-Western District of Western Australia possesses a climate admirably adapted for the production of fine crops of healthy grapes. One does not meet here with either extremes in the ranges of production. A good average yearly crop of grapes can be reckoned upon with certainty, the yield being neither very low, as is often the case in very dry localities, nor very high, as is the case on the rich bottom lands of the South of France.

Where heavy bearing varieties of vines are extensively grown, the result is apparent in the quality of the must pressed out of the grapes. It is neither excessively heavy with sugar, and for that reason difficult to ferment, nor is it watery and tart. The wine resulting from it is, when carefully made and handled, good of quality, keeps well, and neither excessively spirituous and heavy, nor thin, of poor body, and of bad keeping quality.

In the following list I give, with the kind of grapes more extensively used in Western Australia, the amounts, in gallons, of wine made from what is considered a yield above and below the average:—

Class A comprises grapes producing small crops of wine of special quality, which are used for blending with wines made from grapes named under Classes B and C.

Class B are good, all-round grape vines, much in favour and extensively cultivated.

Class C represents vines of heavy yield, generally planted for blending with wines from grapes in Classes A and B. These grapes by themselves make the best wines for the manufacture of

brandy, and are for that purpose much grown in France, Algeria, and California.

Class A.

Cabernet	100 to 200 gallons
Pinot	100 to 200 ..
Riesling	150 to 250 ..

Class B.

Verdelho	200 to 250 gallons
Pedro Ximènes	200 to 300 ..
Shepherd's Riesling	200 to 300 ..
Shiraz	200 to 300 ..
Malbeck	200 to 300 ..
Morastel	200 to 300 ..
Br. Muscat, of Frontignan	200 to 300 ..

Class C.

Mataro	300 to 400 gallons
Aramon	350 to 500 ..
Trebbiano (Carror's)	350 to 500 ..
Folle Flanche	350 to 500 ..
Doradillo	350 to 500 ..

In the coastal districts grapes named in Classes A and B give a must containing 18·5 to 24 per cent. sugar, which, after fermentation, produce a wine containing 12·5 to 17 per cent. alcohol by vol. (10 to 14 per cent. by weight), equivalent to 22 to 30 per cent. proof spirit.

Class C grapes give a must containing from 17 to 22 per cent. sugar, producing a wine with from 11·5 to 15·5 per cent. alcohol by vol. (9·2 to 12·5 per cent. by weight), equivalent to from 20 to 27 per cent. proof spirit.

Theoretically speaking, of wine from Classes A and B, 6 to 8 gallons will make one gallon of absolutely pure grape spirit, but these are not used for that purpose.

Of Class C, 8 to 10 gallons will make one gallon of pure grape spirit.

During the process of skilful distillation, however, there are impure alcohols, unfit for consumption, which are separated from the bulk of the spirit and discarded; and when these waste products are accounted for, the average of grape brandy reduced to proof strength—the strength of the good brandy of commerce—it is considered that it takes four gallons of the stronger wines and five gallons of the lighter to produce one gallon of proof-strength brandy.

In the Eastern Australian States brandy is to a very great extent made of “pricked” or “off” wine, i.e., wine rendered unmarketable owing to a taint of, very often, either acetic or lactic acid, or of moulds, which make the wine “mousy.” As the acids

named have been produced at the expense of some of the alcohol in the wine, it follows that, for brandy making, such wine is impoverished of its alcohol proportionately to its degree of acidity, and of such wine 7 to 8 gallons are required to make one gallon of proof brandy.

The following table gives the maximum amount of the raw material required to make one gallon of proof brandy:—

5 gallons of sound wine.
8 gallons of sour wine.
8 gallons of grape pomace from the fermenting vat, plus 4 gallons of water.
8 gallons of lees or of piquette.
16 gallons of wash.
16 gallons of pressed skins and 8 gallons of water.

COST OF PRODUCTION OF THE RAW MATERIAL.

By "raw material" with reference to brandy making, I mean sound wine especially prepared for the purpose, and also the refuse of the fermenting house and of the wine cellar, which would, unless utilised for that purpose, be to a great extent wasted. I will assume, in order to arrive at an approximate estimate of the cost of the production of white wine for the purpose of making brandy, that a large stretch of the second-class land of this State, such as is met with, say, in the region of the Swan, the Murray, or the Ferguson and Preston rivers, and consisting of light loam overlying a sub-soil of gravelly ochre-coloured stiffish loam, or of limestone formation, with abundance of fresh water at a depth of from 10 to 30 feet from the surface, and with a good and reliable rainfall of 28 to 30 inches.

That kind of country is often under stunted Jarrah, Red Gum trees, with occasional patches of Blue or Flooded Gums, Stinkwood, Wattle, Banksia, and Sheoak (*Casuarina*), or under Tuart Gums and Blackboys and Banksia. Numerous small vineyards have been very successfully established upon that latter kind of country, and present a healthy and thriving appearance, bearing well and producing a wine clean and free from the peculiar "earthy taste" sometimes noticeable in wine made from vines grown on rich alluvial bottom lands. In arriving at the following estimate the high cost of labour and horse feed at present ruling have been taken as a basis for working out the cost. I also assume that provision has been made the previous year for striking vine cuttings in a nursery, as, in this climate, rooted vines give far more satisfactory results than vine cuttings when a vineyard is planted. Attention to this detail would cheapen the cost of rooted vines by £2 an acre, or £200 for a 100-acre vineyard.

FIRST YEAR.

<i>Cost per acre.</i>	£	s	d.
Grubbing and clearing ...	6	0	0
Fencing ...	0	15	0
Ploughing and harrowing ...	1	5	0
Plotting and digging holes ...	1	10	0
Planting ...	1	0	0
Cost of rooted vines and fertilisers ...	1	10	0
Baiting for grubs ...	0	10	0
Scarifying and hoeing ...	1	10	0

£13 10 0

Interest at 7 per cent. on capital 0 18 6

£14 8 6 per acre,

or for 100-acre vineyard, £1,442.

SECOND YEAR.

	£	s	d.
Pruning ...	0	6	0
Two ploughings ...	1	0	0
Hoeing ...	0	15	0
Replacing misses ...	0	15	0
Scarifying ...	0	15	0
Sulphuring and baiting ...	1	0	0
Interest at 7 per cent. on capital	1	3	0

£5 14 0 per acre,

or for 100-acre vineyard, £570.

THIRD YEAR.

	£	s	d.
Pruning, tying, and picking cuttings ...	1	0	0
Two ploughings ...	1	0	0
Hoeing ...	0	15	0
Replacing misses ...	0	8	0
Scarifying ...	0	15	0
Sulphuring and baiting ...	1	0	0
Interest on capital at 7 per cent.	1	12	0

£6 10 0 per acre,

or for 100-acre vineyard, £650.

Approximate total cost, at
per acre, for three years ... £26 10 0

Total cost, at per 100 acres,
for three years ... 2,650 0 0

To this should be added cost of water conservation, cottages for men, tools, implements, carts, horses, and also cost of land and cost of supervision.

At the termination of the third year there would be in hand a crop, which, after deducting the cost of picking, would be an asset against the upkeep of the vineyard for the fourth season.

About that time it would be advisable, in order to maintain the fertility of the land and the fruitfulness of the vineyard, to spend every three years, on alternate blocks, about £1 worth of chemical fertilisers, or, say, an expenditure at an annual rate of 7s. per acre.

FOURTH YEAR AND AFTER.

From the time of pruning to vintage, inclusive, the cost, when the vineyard is in full bearing, would be :—

	£	s.	d.
Pruning, tying, picking, and removing cuttings	1	10	0
Two ploughings	1	0	0
Hoeing round vines and scarifying	2	0	0
Sulphuring and manuring	1	5	0
Picking 4 tons grapes and carting to cellar	2	10	0
Interest on capital at 7 per cent.	2	10	0
	<hr/>		
	£10	15	0

or on a 100-acre vineyard, £1,075, bringing the cost price of the grapes up to £2 16s. per ton.

This does not include interest or sinking fund on purchase cost of the land and plant, and on cost of supervision.

COST OF MANUFACTURING WINE FROM PRODUCE OF 100 ACRES OF GRAPES—CLASS C.

One ton of grapes gives from 125 to 135 gallons of must; allowing a shrinkage of from 25 to 35 gallons to represent waste, evaporation, lees removed, racking, etc., up to the time when the wine is distilled (a very liberal allowance). We see that one ton of grapes yields at least 100 gallons of marketable wine; or one acre, yielding four tons of grapes—planted with Class C grapes—will produce 400 gallons of wine; and 100 acres, 40,000 gallons.

Given a well equipped wine cellar, the cost of crushing, pressing, fermenting, caskage, racking, and housing for one year is well within 4d. a gallon, for one acre, at 400 gallons, equals £6 13s. 4d., and 100 acres, at 40,000 gallons, equals £666 10s.

TOTAL COST AT PER GALLON PER ACRE, AND PER 100 ACRES OF GOOD SOUND WINE FOR BRANDY MAKING.

From the above data we see that the cultivation of one acre of vineyard, producing four tons of grapes, delivered at the cellar, will amount to £10 15s. The manufacture of same into 400 gallons of wine amounts to £6 13s. 4d., or a total of £17 8s. 4d., or for 100 acres, £1,770, which brings the cost of the wine, at per gallon, 10½d.

Of course it should be borne in mind this only applies to vineyards planted with vines yielding large crops of grapes.

COST OF BRANDY MANUFACTURE.

I have not considered the amount of capital required for providing cellars accommodation and distillation plant for manufacturing the wine from a 100-acre vineyard into brandy. The amount at per acre will decrease as the area under cultivation increases, but after going very carefully into the matter, I estimate that the initial capital required in the case under cultivation will be within 1s. for each gallon, or £20 per acre, or for 100 acres about £2,000, with a material decrease for every additional 100 acres.

Victorian and South Australian distillers estimate the cost of distillation at $1\frac{1}{2}$ d. per gallon; in France it is somewhat less when handling large quantities of wine. It is safe to reckon it at 2d. per gallon. From this we see that brandy costs:—

	s.	d.
Five gallons of wine, at $10\frac{1}{2}$ d. ...	4	$4\frac{1}{2}$
Cost of distillation, at 2d. per gallon ...	0	2
	<hr/>	<hr/>
	4	$6\frac{1}{2}$

We thus see, by grouping these figures together, that:—One gallon of pure grape brandy would cost to produce, say, 4s. 6d.; one acre of brandy grape vines would produce 80 gallons of brandy, costing 4s. 6d. a gallon, equalling £18, or for 100 acres £1,800.

UTILISATION OF REFUSE.

The wine from a 4-ton crop to the acre, of grapes of the heavy-bearing class under consideration, it is thus seen, will yield 80 gallons of proof brandy, but there is still left, besides this, a quantity of grape spirit in the pomace or the compressed cake constituted by the skins and stalks from the fermenting vat, which can easily be extracted at the following approximate cost:—

I have stated above that it is reckoned that it takes to produce one gallon of proof brandy—

- 8 gallons of fresh grape pomace and 4 gallons of water.
- 16 gallons of wash.
- 16 gallons of compressed cake and 8 gallons of water.
- 8 gallons of lees or piquette.

One ton of grapes will yield about 130 gallons of grape juice (about 1,600lbs.), leaving about 600lbs. of stalks and of pressed skins. 600lbs. of fresh grape pomace represents, roughly speaking, 60 gallons, which after fermentation would yield, theoretically, $7\frac{1}{2}$ gallons of proof brandy, but after allowing for the elimination of the undesirable alcohols and fusel oil, would practically yield 3 to 4 gallons of pure proof brandy, or at the rate of about 15 gallons of

brandy for one ton of fresh grape pomace, the produce of a 4-ton crop of 1 acre of grapes. Thus a 4-ton crop of grapes would yield:—

400 gallons of sound wine, producing 80 gallons of brandy.

One ton, or over, fresh pomace ... 15 " " "

Lees ... 2 " " "

Total amount of brandy from 4 tons } 97 gallons of brandy.
of grapes

These figures show that, without reckoning the interest and sinking fund on purchase of land, and cost of management, 100 acres of productive vineyard land in the locality referred to would yield, at a cost of a little over £1,800, 9,700 gallons of pure grape brandy, worth at least 16s. a gallon, equal to £2,900, or after making a very liberal allowance for interest and sinking fund on capital cost of land and plant, supervision and cost of production, the net profit on such a venture can safely be put down at £500 to £600 per 100 acres.

IN-AND-IN BREEDING.

SOME OF ITS DANGERS.

There is probably no one question connected with the breeding of stock that has received closer study or more extended research than that which stands at the head of this article. The theory is sound beyond question that by breeding in a long line of established merit, the particular characteristics sought become fixed in a measure proportioned to the length of the line of descent. Hence in case of a male and female of high merit, and both of the same line of breeding, when coupled together the special merits of the family should be intensified in the offspring. This has been found to prove true in practice.

The close breeding in a particular line has been practised more or less by all breeders who have acquired distinction in building up a family of animals specially noted for merit in a particular direction. It was in this way that the characteristic rich milk of certain families of Jerseys was fixed, and it is through the same line of breeding that the great milk and butter performers of that breed are now being multiplied. So, too, it was in the same way that the thick coating of flesh and the white markings were fixed in the popular Herefords, and that Thomas Bates established the notable family of Shorthorns that bore his name, and recently that the now popular "Scotch Shorthorns" were fixed in the type

that is giving them so wide distinction at the present time. Through this same line of in-and-in breeding a notable dairyman in Maine has built up a family of remarkable performers in his herd of Jersey cows.

But there is a limit to the extent to which this line of effort in building up improvement in animals can be carried. In-and-in breeding for the purpose of extensive development of a single characteristic, carried too far, breaks up the balance of the animal. Nature rebels against so one-sided a work. The constitution of an animal, the powers of endurance, must be built up along with performance, and kept in balance with it, or when a trial comes, the animal will break down under the strain.

Intensive milk or butter production, as an example, cannot be built up in a cow and maintained indefinitely unless along with it are built up powers to endure the work. Milk fever among the best cows, weakened offspring, and consequent disease in the great performing herds are Nature's protest against the one-sided work of performance alone being carried further. All along the way among the great masters of the art of breeding, wrecks have finally set the limit to what can be reached by continued in-and-in breeding. The most disastrous example of this kind known in the business, probably, was the going to pieces of the cattle from the New York Mill's herd of Bates' Shorthorns, sold at auction at fabulous prices, yet proving of little value as breeders afterwards. Many less noted examples are to be found among those dairymen and breeders intent on building up a herd with the one point of great performance in view.

In-and-in breeding, therefore, has been practised with advantage up to a certain undefined limit, but has proved a failure in every attempt to pursue it indefinitely.---*Main Farmer.*

TREATMENT OF CATTLE.

DISHORNING.

C. B. LANE, NEW JERSEY EXP. STATION.

Dishorning has rapidly grown in favour during the past few years, and at the present time it is commonly practised in many sections. The prejudice and exaggerated ideas as to the severity of the practice are gradually giving way as instruments for doing the work improve, and farmers and dairymen become better acquainted with the operation.

In our own experience we have found it to be practical, rendering the animals, especially bulls, more quiet, and making them less capable of injuring each other or their attendants. During our first experience in dishorning, the horns were removed with a saw. While the operation was successful, and no serious results followed, it required considerable time, and was evidently quite painful to the animal.

Later, a pair of Keystone clippers were secured, and three cows and one bull were dishorned. It required but a second to remove a horn after the clippers were placed over it, and the whole time required for operating on a single animal did not exceed more than four or five minutes, except in the case of the bull, where greater precaution was taken to make the animal secure.

All the wounds bled at the time of the operation, but not to such an extent as to cause the animals to show signs of weakness. They did not appear to be in much pain except at the moment the clipper was in process of closing. When taken to the stalls after the operation two of the cows ate as though nothing had happened, while the third refused a part of her food for a day, but her usual appetite soon returned. The operation had a marked effect on the three-year-old bull. Previous to dishorning he was inclined to be ugly, but after the removal of his horns he was comparatively quiet and docile.

Complete records were kept of the yield of milk from the three dishorned cows for 20 days previous to the operation, also for 20 days following, and it is interesting to note that the decrease in the yield of milk from these cows was 3.3 per cent. greater than for three other cows not dishorned and giving practically the same yield at the time of the operation, showing that the milk flow was but slightly affected. This difference might have been due, in part, at least, to some other cause.

The simplest and most humane way of destroying the horns seems to be to prevent them from developing when the animals are young. This may be done by the use of caustic potash (in the form of sticks), which rapidly destroys the skin and other tissues when kept in contact with them. The method of applying the potash is very simple. The hair is clipped away from the young horn, so that the potash may come in immediate contact with the parts to be treated. The stick of potash is rolled up in a piece of paper, so as to leave one end exposed. The exposed end is moistened slightly and rubbed on the embryo horn for a few seconds, or until the skin begins to start, care being taken that the whole of the border is included in the treatment. A surface about three-fourths of an inch in diameter will cover the parts in calves a few days old. In our experiments, six calves have been treated; their ages ranged from 3 to 18 days. Healing soon followed the operation, and smooth polls have resulted in every case. The best time to apply the potash is between the fifth and tenth days, although it has proved effectual even on the eighteenth day.

TUBERCULOSIS.

SIMPLE METHODS TO ERADICATE.

A. A. SOUTHWICK, MASSACHUSETTS.

In exterminating tuberculosis I have kept constantly in mind the causes and the manner in which it seems to be most likely to be propagated. In watching the dreaded malady for 30 years I have never seen a diseased animal on either side of an affected one or where a diseased one has stood, when the stall has been properly cleansed after her removal.

This would seem to prove, to a certain extent, that the disease is not transmitted by close proximity to diseased animals. A predisposition to the disease seems to be a reasonable cause in particular cases. If close observation of conditions is of any value whatever, one must conclude that the common carrier of this disease is dust. I am firm in the belief that if every broom could be banished from the care of farm buildings and dwellings, tuberculosis would diminish most rapidly.

Every place where dust or filth accumulates should be washed and not swept. This would avoid dust almost entirely. One of the best precautions would be to educate people to the importance of using some of the harmless germicides in all water used for cleansing, especially where there are lodgments of dust. Doubtless the very best germicide yet discovered is formalin, 1 quart to 50 gallons water.

Where hose and sufficient pressure are at hand, a stable can be put in most admirable condition when the storage room is clear of fodder, and the stable free from animals. Commence in the roof, wash everything clean to the basement. If so good a service as this is not available, dampened brooms will take down the cobwebs and dust on the beams till the floors are reached, when buckets of water and brooms can be used most effectively with scarcely a trace of dust floating in the air.

Whitewash the stables often, especially as soon as fly time is over in the fall. Put in 2 quarts carbolic acid to a barrel of the whitewash. One of the best things to use in the stable is creosote. Dress the mangers with this all over, except the bottom, where the feed will be. Take a number of days for the operation, so there will not be too strong an odour in the stable at any time. When once done, then touch up a little all round occasionally, so that some odour will be apparent at all times.

Ventilation for the cow stable was provided by ingress of pure air all the time from open windows, so arranged that no draught could fall directly upon a cow. Plenty of chance was given

for the egress of foul air in the roof. Any animal that became undesirable from any cause was turned over to the butcher at the earliest possible time. Out of a large mortality amounting to 14 animals in a herd of 65 the first year, the difficulty gradually diminished till at the end of 12 years extermination of the disease seemed complete. After the tuberculin test came into vogue it became possible to secure animals that successfully passed the examination, and the situation became materially improved.

One of the best arrangements that could be made to take effect throughout the State would be the testing of every cow offered for sale, because either party in a trade is not at all certain of a healthy animal. Such cases often come to notice. So far as one can judge from actual facts it is an ill-advised idea to test whole herds, because there are so many causes which can intervene that might condemn a creature that could be used profitably a little later on.

One of the best precautions is to endeavour to discover diseased animals at the earliest possible time. If one cannot decide with reasonable certainty as to the case from the well-defined symptoms, which scarcely vary in the different subjects, then apply the tuberculin test to make the matter positive.

THE 300lb. BUTTER COW.

(Extract from a paper read at the Ninth Annual Meeting of the Missouri (U.S.A.) Dairyman's Association, by H. C. GOODRICH.)

The 300lb. cow is no myth, though many people are very sceptical concerning the ability of any cow to produce that much butter in a year. Neither is she necessarily one of these pure-bred animals whose high price puts her above the reach of the ordinary farmer. She is an everyday farmer's cow that may be bred and reared on every farm.

But how are we to get a herd of 300lb. cows? Of course, if one has plenty of money, with the exercise of proper care in selection, he can buy them. Another way, which calls for the outlay of but little money, is to raise them. Ten years ago, at Hilltop Farm, we got together a herd of 10 cows, of which a part were crossbred Jerseys and the rest common cows. We then bought a good Jersey bull to head the herd. From this beginning we now have a herd of 30 cows that have passed the 300lb. mark.

Our method is to weigh the milk of each cow separately one day in every month and record it. Then, by using the Babcock tester occasionally we can find out about what each cow is doing. If any of the cows prove unprofitable milkers they are sent to the butcher. Then, if we have more cows than we care to keep, we sell those that are making us the least profit, never allowing anyone to take his pick of the herd at any price. Sometimes, when one has a surplus of cows, and a buyer offers a fancy price for one of your best cows and refuses to take any other, it takes some firmness to refuse to sell her, but it pays to do so. In this process of improving a herd the scales and Babcock test are indispensable.

In our original herd we had one cow that we did not think especially good, that, with better food than formerly, made, as estimated by the scales and test, over 500lb. of butter in her eleventh year. This showed us the possibility of some of our common cows.

We cannot always tell by the performance of a heifer with her first calf what she will do at maturity. Some of our best cows were rather a disappointment with their first calf.

A dairy cow, to give good results, must be well provided with shelter from the cold of winter, as well as from the heat of summer. A cow cannot make milk if she is subjected to the extremes of temperature—shivering in the cold during the long winter nights, and fretting with the heat of midsummer.

Good food, and a regular supply of it, is necessary. The cow that produces good milk is a worker, and the better you treat the worker the more liberal will be her response.

Our herd of about 30 cows, including heifers with first calves and dry cows, have during the last two years made 19,880lb. of butter, which is a yearly average of 331lb. of butter per cow.

VINE GROWING IN BORDEAUX.

Through Mr. H. B. Lefroy, the Agent General for Western Australia, this Department has received on the subject of the Trade and Commerce of Bordeaux an interesting report from Mr. W. R. Hearne, the British Consul at Bordeaux, from which interesting information is gleaned.

Thus, on the vintage production throughout France:—"The French vintage of 1900 is calculated to have given 1,481,758,542 gallons, which is an increase of 427,789,582 gallons over the vintage of 1899, and of 771,554,542 gallons above that of 1898, two good years as regards quantity. It has been surpassed in quantity by the vintages of 1865 and 1869.

The reconstitution of the vineyards by means of grafting on phylloxera-resisting stock, which was apparent in only 32 departments in 1899, was increased in 50 departments in 1900, and the vines under cultivation in the latter year exceeded those in the former year by 80,844 acres, the total area under cultivation in 1900 being 4,275,944 acres. The average yield per acre in 1900 was 346 gallons, or an increase of 95 gallons per acre over 1899.

[This, however, is not the average yield of the French vineyards, being the result of comparatively abundant years, the average being about 200 gallons to the acre.]

There is no doubt that claret is not now in favour in the United Kingdom, and there are many reasons given for this. No doubt a series of bad years may have had something to do with it, but with a succession of three good vintages this reason would now no longer hold good. Another reason is that there is no certainty that when you ask for claret that you get a wine grown in the claret country or even in France. There would be nothing easier than to make certain of this, if wine merchants and shippers would have their own marks on the bottles as a guarantee of the origin and quality of the wine. Beer and stout, whisky, cognac, and champagne are guaranteed in this manner, why not claret? It is possible and even probable that there is yet another reason, and that is that the bouquet and flavour of the Gironde wines may have changed from what they were in days gone by, owing to the periods of disease and remedies against disease through which they have passed. It will be said that the soil and climate remain the same as ever, and that, therefore, the wine should not change. The question arises, however, as to whether the bouquet and flavour of clarets are entirely dependent on the soil and climate, and whether the grape itself has not got still more to do with this. It has been for many years asserted by Mr. Bellot de Minières, an eminent and practical viticulturist, who has spent much time and money, in his own vineyards, in making experiments, that the grafting of French vines on to American stocks, in order to combat the phylloxera, does gradually, but perceptibly, alter the character of the grape; and more than this, the American stock is acted on by the French graft and gradually loses its identity, the result being a hybrid plant having none of the good qualities of either family, but afflicted with the weaknesses of both, so that, little by little, the roots, having undergone a change, offer less and less resistance to the phylloxera, till at length the grafted plant has to be treated with sulphuretted carbon to the same extent as the ungrafted French vine.

Two eminent men of science, Messrs. Bonnier and Daniel, have also given their support to this theory, and have explained the theoretical and practical results of obtaining, by grafting, hybrid varieties. This action, they state, which is very powerful in herbaceous plants, contrary to what was formerly supposed, is equally powerful in ligneous plants, and explains how, with time, the older vines and some of the most renowned vineyards, which have become the victims of grafting, with the view of enabling them to combat the phylloxera, have lost by degrees the well-known qualities of their wine.

M. Bellot de Minières is a great believer in the future of Australia as a wine-producing country, but if the Australians imitate the Russians by planting vines grafted on American stocks, and also by treating them with lime and copper washes, they will succeed in producing, as the Russians have done, wines which they can neither drink nor sell. He believes that there is no country that can produce such claret as France, but if any country can ever approach it that country is Australia, if only the vines are chosen, planted, and treated as they are on the best vineyards of the Gironde. He believes that stony, gravelly soil can be found there, acted on by radiatory points of solar incidence similar to that found in the Gironde, and that in time, with care, Australian wine will be grown resembling greatly in bouquet and flavour the wines of the Gironde.

This gentleman's ideas on the subject of the vine, although strongly opposed and even ridiculed by the wine merchants of Bordeaux especially, are well deserving of serious consideration. He looks upon his beloved Gironde as one of the most enchanting spots in the world, producing wines unsurpassed in bouquet and flavour. Certainly, without the aid of the remedies employed by most of the other vine growers, he has succeeded in bringing his own vineyard to a state of perfection, and its wines to the top of the tree.

He has a theory that it is its great interest in wine that has caused Bordeaux to remain behind Antwerp, Liverpool, and Hamburg as a seaport. Situated on the banks of one of the finest rivers in Europe, with such affluents as the Dordogne, Tarn, and Lot, in connection with the canals of the Midi and Rhone, and, at the same time, the terminus of an enormous railway system, all of them opening up communication between the Atlantic and the Mediterranean, from the Pyrenees to the Alps, Bordeaux should be the most important port in France. But for ages Bordeaux had no other thought but the wine trade, which was so flourishing that it enjoyed prosperity without any effort. The merchants bought wines on the spot, sent out their samples, and the post brought back the orders by return. They came flowing in, and the wine was resold wholesale with a gain of 15 per cent. on the gross outlay. The merchant with a private connection gained 25 or 30 per cent., and the Gironde, and especially Bordeaux, was a land flowing with milk and honey. This prosperity, which called forth neither effort

nor energy, brought with it an indifference, a kind of physical and intellectual torpor, which first of all let the maritime commerce escape, followed by the monopoly of the wine trade which Bordeaux enjoyed. The wine deteriorated, and commerce, which had but that one string to its bow, disappeared, resulting in the panic of 1899 and the present stagnation.

M. Bellot de Minières considers that the commercial system of Bordeaux must be re-awakened, that it must seize the idea of great lines of steamers, of great commercial enterprises, and it must be welded to the British Colonial Commonwealth of Australia and the Cape. The prosperity of those far distant countries must be brought to nourish Bordeaux, and then the prosperity of the latter will increase that of the younger lands. Without in the least prejudicing the vineyards of the Gironde, their wine can be mingled with that of Australia and the Cape. Thus, the Gironde, like the rest of France, having gone in for grafting vines and their treatment with lime and copper, the wine has lost its properties of days now gone. Consequently France, and especially Bordeaux, is bound to get from warmer lands wine rich in colour and alcoholic strength to fortify its own wines which, previous to the introduction of grafting, were used for that purpose. The South of France has imported largely from Spain, Portugal, and Dalmatia. Why not then bring some from Australia which, seeing the immense zone she possesses fit for wine-growing, will provide just as good wine, if they only know how to set about it, as Spain or Dalmatia. Some may say that the distance is an obstacle, but if anyone had stated 50 years ago that Californian or Australian wheat would one day compete with French wheat, he would have been considered mad, and yet this has come to pass.

Then, again, there is Australian timber. At the Paris Exhibition last year Australia exhibited a phenomenal collection of hardwood for building, as well as for cabinet and joiner's work. For the former use this timber can compete on equal terms with the pinewood of Scandinavia, while it eclipses it entirely for the latter use. This is another source of industry which should unite Australia with Bordeaux, which port commands the whole central basin of France, Languedoc, and Provence, and could successfully compete with Havre or Antwerp for the Swiss trade, and by differential tariffs on the Orleans Railway could place on board ship in the Garonne, Parisian manufactures at every bit as low a rate as the Western Railway of Havre. Consequently, to restore Bordeaux to its former prosperity, what is required are men of business capacity and energy who can grasp and bring to fruition this great economic question, and open up a growing communication between Bordeaux and the greatest colonies of the British Empire.

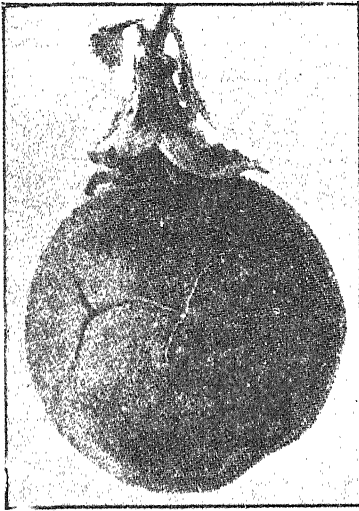
These ideas, culled from M. Bellot de Minières' letters to me, are given here for what they are worth, and if they fail to awaken the Bordelais to a sense of the situation, I feel sure that they will be read with interest in Australia, where the future of the wine trade promises such an enormous development.

WOODINESS OF THE PASSION FRUIT.

A. DESPEISSIS.

A disease hitherto unknown in Western Australia was, last season, first observed on some locally grown passion vines. That disease has of late years played havoc with the passion fruit plantations around Sydney, and our ports have this season been made the dumping ground of several important consignments of diseased passion fruit.

The figures illustrating this "woodiness" show the disease in a mild form.



A woody Passion Fruit nearing ripening, showing cracks in the rind.

They are taken from a Paper on the subject, prepared by Dr. N. A. Cobb, Government Vegetable Pathologist of New South Wales.

The disease is still an obscure one. First observed around Parramatta some seven or eight years ago, it has since spread to the whole surrounding County of Cumberland, where its progress is more or less erratic.

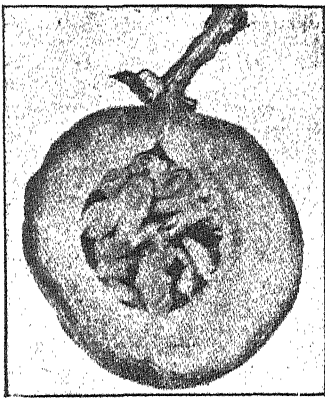
It affects most vineyards in the locality named, and at the same time spares a few in the centre of infection.

Even in a diseased vineyard some plants escape; the disease is less common on moist, free soil, suited to passion fruit, than elsewhere.

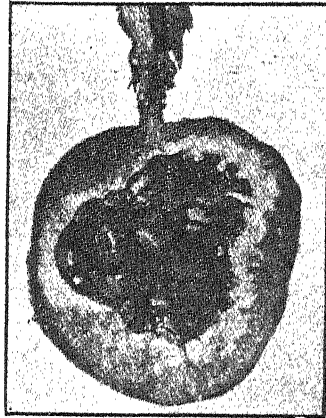
SYMPTOMS.

A "woody" passion vine is stunted in growth, with short distorted canes, of pale-yellowish leaves instead of a dark-green colour. The stocks are sometimes enlarged and knobby; much of the fruit drops early, the rest hang on, become distorted, crack on the surface, and when cut open are either empty and show a considerable thickness of the rind, or what there is of the edible pulp is thin,

has a "flat" taste, with a colour different from that found in healthy fruit. The seeds do not ripen properly, and remain light and sometimes glassy instead of turning black.



Diseased fruit, little commercial value, such as shipped to our ports. The seeds would germinate and propagate the disease.



Diseased Passion Fruit. The pulp would have a "flat" flavour, and the seeds would not germinate.

CAUSES OF THE DISEASE.

A diseased passion vine often shows amongst woody fruits, some which have every appearance of soundness, and yet seeds from these apparently sound fruit contain in them germs of the disease which, when sown, they transmit to the resulting plants.

Exposed situations and frosts are also known to have a prejudicial influence on passion vines showing a tendency to woodiness, but, above all, exhaustion of the soil seems to accompany in most cases the woody disease.

The passion fruit plant is most exacting on the store of plant food in the ground. By reason of its rank growth and its prodigious bearing capacity (it bears two to three crops of fruit each year) it soon exhausts the soil of nourishment as well as of moisture. It has been noticed that, where manured, the vines are less affected by the disease than are vines growing alongside which have been stinted of fertilisers.

Dr. Cobb has observed on the yellow spotted leaves of diseased plants, as well as on the spotted bark of dead branches, a specific fungus which he believes to be associated with woodiness of the passion fruit.

REMEDIES.

The passion vine is a gross feeder. According to Mr. F. B. Guthrie's computation, each passion vine with fruit removes on an average annually from the soil $6\frac{1}{2}$ oz. nitrogen, $1\frac{1}{2}$ oz. phosphoric acid, and $2\frac{3}{4}$ oz. potash, so that a vineyard planted with 300 (12ft. x 12ft.) passion vines to the acre would remove: nitrogen, 117lbs.; phosphoric acid, 28lbs; potash, 52lbs.

Knowing that sulphate of ammonia of commerce contains about 20 per cent. of nitrogen, superphosphate about 14 per cent. phosphoric acid, and sulphate of potash of commerce 50 per cent. of potash, we arrive at the following mixture, in order to restore to the land all the elements of plant food extracted by passion vines, and by a crop of passion fruit, viz. :—

Sulphate of Ammonia	...	...	600lbs.
Superphosphate of Lime	...	...	200 "
Sulphate of Potash	...	...	100 "

Such a mixture, applied at the rate of 3lb. per vine, would cost 4d. per vine or a little over. It should be applied a year or so after the vines are planted.

Besides a liberal application of chemical fertilisers, it has been suggested that, considering that the woody disease is propagated by means of diseased seeds, and, moreover, that in all attacked vineyards there are some vines which always look healthy and appear to be proof against the blight, cuttings be taken from such vines and planted with a view to obtaining passion vines endowed with the immunity of the parent.

BEEKEEPERS' CONVENTION.

A meeting of the West Australian Beekeepers was held in the Museum of the Department of Agriculture on Tuesday, September 29th, at 4 p.m.

The President, Mr. J. Sutton, occupied the chair, and, considering the many difficulties and long distances which separate the several members, a fairly satisfactory number attended; several interested in the Royal Show, which was being held at Guildford, were unable to be present.

The President, having read the circular calling the members together, called on the Secretary to read his report. This showed that it had been somewhat uphill work to keep in touch with bee-keepers generally, although twenty-nine members had paid

their subscriptions, and several had sent in their amounts for the coming year. The income—Subscriptions, £3 12s. 6d.; advertisements in the *Journal* published during the year, £2 10s.; total, £6 2s. 6d. Disbursements—Printing, £4 4s. 6d.; stationery and postage, £2 3s. 6d.; total, £6 8s. Leaving a debit balance of 5s. 6d.

A discussion followed the report as to the best means of keeping in touch with all the members, when it was resolved that efforts be made to make the association one of profit and success.

Mr. A. H. Smith, Baker's Hill, was elected President.

Messrs. J. Allnut (Bridgetown), C. Cook (Chidlow's Well), and J. B. Kline (Guildford), Vice-Presidents.

Messrs. G. F. Charles, C. Jecks, W. Masterson, R. Taylor, A. Selway, J. R. Shipton, and R. Wolfe, Committee, with power to add.

Messrs. J. James and Robt. Cooke, Auditors; and John Sutton, Secretary and Treasurer.

Resolved: That two general meetings be held during the coming year, once during the sitting of the Producers' Conference (time to be arranged), the next in the evening of the first day of the Royal Show.

Resolved: That members be requested to interest themselves, and to urge upon their several members of Parliament to favourably consider the wisdom of retaining the duties, as per arrangement with the Commonwealth, as per the sliding scale, as arranged for this State; and that the Secretary place the resolution before the Government.

Resolved: That the Secretary interview the Secretary of the Department of Agriculture, and arrange to have bee-keeping matter published in the *Journal*, and that the said *Journal* be the official organ of the association.

Resolved: That the best thanks of the meeting be tendered to the retiring officers, which was carried by acclamation, and each suitably responded.

Several matters were brought forward in a conversational manner, which were left in the hands of the committee to deal with, who would endeavour to meet and make such arrangements as commend themselves to them, with reference to the next meeting; The members were requested to do all they could in their several districts to bring the merits of the Association before the bee-keepers in their neighbourhoods, which brought a very satisfactory meeting to a close.

INSECTS ARE NOT PESTS IN THEIR NATURAL HOME.

BY GEO. COMPERE.

This is a subject that has only of recent years attracted the attention of the entomologist throughout the world, and a great deal of discussion has taken place upon this branch of economic entomology of late years, as to what are the agents that play such an important rôle as the controlling factor in the multiplication of insect pests. It has become well understood that insects seldom, if ever, become pests in their natural home, but become so, and more often very serious ones, when transplanted to a new region or country. It was first supposed that climatic conditions were responsible for these changes, but that has been found to have little or nothing to do with it, but is the work of natural enemies, and it will not be many years before the fighting of insect pests with artificial methods will become a thing of the past, and be superseded by Nature's own forces. But before that can be accomplished man will be required to play a very important rôle in the programme.

It is a well-known fact that when any country or region has been left undisturbed by man, all forms of life have accommodated themselves to their surroundings, and under those circumstances it would be most unusual to find that any animal or plant had broken its natural bounds and disturbed the balance of nature. But so soon as man's well-meaning ignorance intervenes the case becomes different: the native fauna and flora are transplanted to other regions and fresh ones introduced, and while some exist with difficulty, others break loose from all restraint and destroy other forms of life and become pests. This is caused by being transplanted from one country to another without also transplanting their natural enemies with them. And it will now be for man to find the home of these various insects' pests, and there seek the natural enemies; and in doing so the greatest care will have to be exercised in transplanting these natural enemies without their natural enemies, or, in other words, the secondary parasites.

Every particular plant in the vegetable kingdom has its enemies in the form of insects, and every particular insect has also its enemies in other forms of insects, and when man removes any plant from its native home, and makes it an object of cultivation, it is often found that it becomes attacked by pests, and more often to such an extent that they kill the plants or destroy their commercial value, and the same argument will hold good with insects; make them an object of cultivation, and it will soon be found that they, like plants, are subject to the attacks of other forms of insects. Take the honey-bee, for example, it has several insect enemies. Were it not for the natural checks upon insects, it is

doubtful if man could exist upon this earth, the fecundity of these little creatures being so enormous they would in a short space of time raze the vegetation from the face of the earth.

The insect pests that the farmers of this State have to contend against at the present time are all imported forms. Of the numerous forms of indigenous ones that are to be found here, none are ever likely to become pests, all being so heavily parasitised or fed upon by predaceous forms, that it is difficult to secure healthy specimens of some species, and especially the scale insects. But transplant a single female specimen or two to a new region, and place it upon the same form of food plant, it will soon become a pest. That is what some entomologists claim is produced by climatic changes; but take the same insects and place them upon a clean plant of the same species in this State, and protect them from their natural enemies, and it will soon be covered with the insects.

In Australia there are a large number of insects of various forms that attack and live upon the various species of Eucalyptus trees, while in California, United States of America, where there are thousands of acres of Eucalyptus trees growing, no insects have ever attacked them, excepting the white scale (*Icerya purchasi*) that country having secured its Eucalyptus trees all from Australia, but by seed, and that prevented their insects' enemies from being introduced; but when the white scale was introduced into that State upon some young citrus trees from this country, it soon attacked the Eucalyptus, as well as all other forms of vegetation, the same as it does here, but here it never becomes noticeable, owing to its natural checks.

A very good illustration upon this subject may be found in a recent publication, by Mr. E. E. Green, on the insects of Ceylon, in which he says all troublesome insects of that island are introduced species. Out of twenty-six species of *Chionaspis* found there only three are injurious, and these three are imported forms.

NOXIOUS WEED.

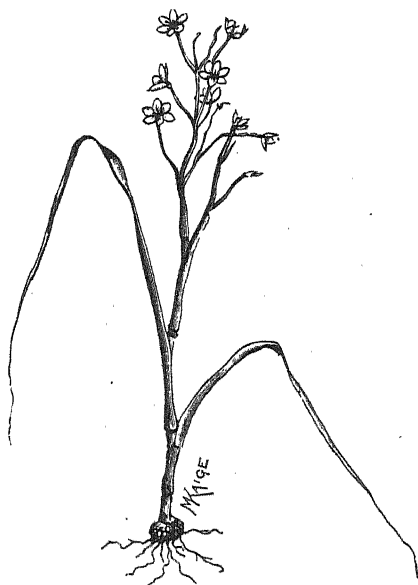
CAPE TULIP.

The Horticultural and Viticultural Expert of the Department of Agriculture reports as follows:—The *Journal of Agriculture and Industry of S.A.* for October revives the interest created every year in the early spring in a poisonous bulb once imported as a garden plant, and which is rapidly taking possession of pastures and of agricultural land in Victoria, South Australia, and Western Australia.

The weed referred to is the one described and illustrated under the name of *Homeria lineata* in the 11th December, 1894, issue of the *Journal of the Bureau of Agriculture of Western Australia*, and in the "West Australian Settler's Guide and Farmer's Handbook," pages 560 and 561.

In the Eastern States it is known as the "Cape Tulip," and botanically called *H. collina*.

This weed is rapidly increasing on the Swan in the neighbourhood of Caversham and of Sandalford, and, I am given to understand, in the Eastern Districts as well—in the vicinity of Northam. It was reported to me a few weeks ago that a farmer at Sandalford lost a bull, only recently brought on to his farm, from the effect of that weed.



THE POISONOUS CAPE TULIP

(*Homeria collina*).

In connection with the existence of a large area of *Homeria collina* (Cape tulip) near Yankalilla, the following report from the *Australasian Veterinary Journal* will be of great interest :—

SERIOUS MORTALITY AMONGST COWS THROUGH EATING A POISONOUS WEED.

By HECTOR G. J. RUNTING, G.M.V.C.

One morning early I was called to a farm in Coburg to attend some cows which had been poisoned by eating a grass or weed commonly known as the "Cape tulip." Upon visiting the farm one glance was sufficient to prove that the poison was very fatal, as dead cows were strewn in a

directions, and many others lying about in a very bad way, some of which died within half an hour of my arrival, whilst others seemed to have apparently little or nothing wrong with them: but closer examination proved them to be also on the long list of poisoned, and before long some of them had also joined their companions in the happy hunting ground. Altogether there were twenty-five or twenty-six cows poisoned, fourteen of which proved fatal.

The symptoms were not well marked. In many cases the animal would be lying quietly down in the natural way, and beyond a dry nose and suspension of rumination there was nothing else to be seen until an attempt was made to rouse the animal up, when it was at once seen that paralysis was present. Some of the cows would get on to their feet by hard fighting, stagger a few steps and fall again, but many others were quite unable to do even that much, and in every case the paralysis seemed to affect the hind quarters more than the fore. Temperature and respirations were normal, pulse weak, nose dry, and eyes wild and staring. There appeared to be no pain until within a very short time before death, when the latter put an end to all suffering. In the cases that proved fatal I noticed that no faeces had been passed, but in those that recovered the faeces voided were very dark and watery, and the greater the amount of diarrhoea present the quicker the recovery. In every case the cows were in a wretchedly poor condition, and therefore little wonder that the mortality was so great.

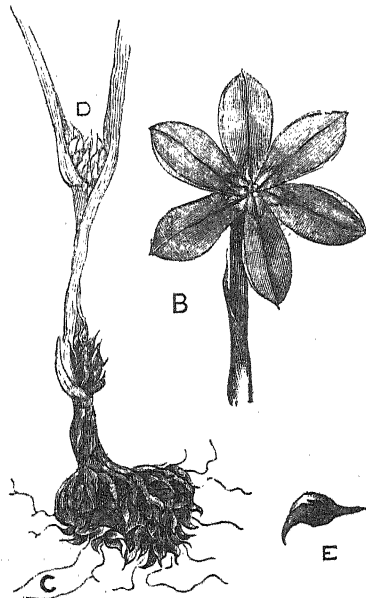
Upon *post mortem* the organs seemed to be sound and healthy, the trouble being confined to the digestive tract. Perhaps the brain and spinal cord would have shown some departure from the normal, but, having a lot to do in trying to save the cows still alive, I had not the time to examine these parts. Not one case before death showed the least sign of tympanitis, but after death the carcase very soon became swollen, and a wonderful amount of fluid escaped from the rumen per nose and mouth, the fluid being of a dirty, dark, watery nature, much of which was found in the rumen upon opening. In each case the rumen was full of the noxious weeds, which extended to the third stomach, or omasum, the latter being in a healthy condition and full of a dark-coloured matter similar to that found in the rumen and fairly fluid. The grass seemed to pass no further than the third stomach, but it gave off a dark, blackish fluid, which passed along the intestines, staining such parts black; in one case half the intestines were quite black, and further on were spotted with small black round spots.

Treatment.—Being unable to obtain any oil, which I believe would prove fairly beneficial if taken in time, I was obliged to try other remedies. Hypodermic injections of strychnine were tried to overcome the paralysis, and the galvanic battery was tried with the same purpose, but the result was far from satisfactory. I tried hypodermic injections of eserine to cause purgation, but had no result; then a combination of eserine, veratrine, and pilocarpine, also with no result. In some of the favourable cases drenches of salts and treacle were given, which appeared to act well, and in some instances repeated doses of milk and tincture of opium were given, with apparently satisfactory results; but, at the same time, I do not feel inclined to give such drenching much credit, and I put the recoveries down to the fact that such animals had not eaten a sufficient quantity of the weed to kill. One cow did not walk more than 50yds. away from where she was feeding before she fell dead.

The botanical name of the plant is *Homeria collina*, and more commonly known as the Cape tulip.

The poisonous nature of the plant has been known in the district for some years, but some of the farmers allow their cattle to run on it daily, and, providing the cow is in fair condition, with a fair amount of food already in the rumen, she does not take readily to the weed at all, or the little she eats has no bad effect; but if cows are in very poor condition and hungry, such as those were, then the result, as just proved, is most disastrous.

I can find no record of the poisonous principle of this plant, nor of its physiological action. Its poisonous action is evidently upon the cerebro-spinal system, but there is room for careful investigation on the subject.



REFERENCE TO PLATE.—B, flower; C, bulb with bulbils; D, aerial bulbils at nod of stem; E, a single bulbil (approximately natural size).

The existence of this weed in small patches in the Yankalilla district was brought under the notice of the Bureau many years ago, and several recommendations were made to have it brought under the provisions of the Noxious Weeds Act before it spread far. Unfortunately the desired action has not been taken, and now the weed occupies considerable areas of land in the locality in question, and has already been responsible for some losses of stock, besides occupying much good land to the exclusion of pasture grasses. The weed has also been reported from other localities during recent years.

The report from the *Australasian Veterinary Journal* submitted throws light on the symptoms of poisoning caused by *Homeria* bulb, and is, I think, worth re-publishing on that account.

Considering that the bulb is just beginning to spread in Western Australia, its eradication could, I dare say, be effected at a small cost by declaring it a noxious weed.

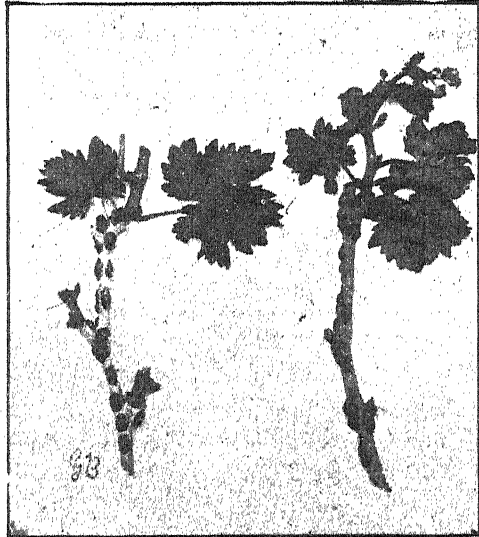
The illustrations have been previously published in the *W.A. Settler's Guide and Farmer's Handbook*.

A NEW SCALE.

A. DESPEISSIS.

Within the last few weeks a formidable-looking scale, new to Western Australia, has been detected in some of the gardens along Adelaide Terrace. For the information of growers, an illustration of the scale is here given.

It is, when full grown, of a shiny dark-brown colour. It is boat shape, or elongated hemispherical. A longitudinal carina runs like an indistinct ridge the entire length of the body. The full sized scale is $\frac{1}{4}$ in. long and $\frac{3}{16}$ in. wide, but the shape and size become irregular when the insects are crowded together. It has, as pointed out by Mr. Compère, every appearance of the insect known as the



brown apricot scale (*Iecanium pruniosum* var. *Armeniacum*); but, to make assurance doubly sure, specimens have been submitted to specialists on scale insects.*

The pest is covered with a large amount of waxy material. It is very conspicuous, is easily killed, although its eggs seem uncommonly resistant to the fumes of hydrocyanic acid gas in moderate doses, sufficient, however, to destroy eggs of other scales. Mr. J. Cole, of Adelaide Terrace, first complained of this scale attacking his grape vines and pear trees. A careful inspection of that locality has since resulted in many of the gardens in that locality showing this scale. It has also been seen in isolated gardens in Hay Street, Crawley, Claremont, and Leederville. It attacks grape vines preferably, and is especially found on the new wood of the season and of the previous year's growth. Pears, mulberries, and the Osage orange are also affected. That the pest

* Mr. A. M. Lea, to whom specimens were submitted, says:—"It appears to be quite new to Australia. From a brief notice I came across, I believe it to be *Iecanium Persicae*, but I cannot be positive, as I have not seen a technical description of that species."

has been accidentally introduced into Western Australia there is no doubt whatever. It is not known yet to be wide-spread, and has hitherto been noticed in damp, sheltered spots only. It is feared, however, that it may prove a serious pest on the grape vines of the State, hitherto remarkably free from insect pests; and, in the interest of all, the Department will be glad to receive early intimation of its presence wherever detected. The infested gardens are under treatment, and the scale has already been eradicated from several of them.

THE CONSERVATION OF TIMBER.

The following report by Mr. Forest Ranger Patterson to the Minister for Lands should be of interest to those settlers who have not yet destroyed all the timber on their holdings:—

“In the interest of timber conservation, I beg to draw the attention of the Hon. the Minister for Lands to the desirability of advising settlers in general, what profit will eventuate at no distant date, if attention is paid to the conserving of valuable mature or young timber on part of their holdings not immediately required for cultivation. I have every belief in ring-barking for the improvement of pastures, still, I contend that on each individual acre in *grazing paddocks* (in timber country) if the valuable mature timber or young saplings of straight, healthy growth were conserved, the grasses would not be prejudicially affected thereby to any noticeable extent, either in density or nutritious properties.

“The mature timbers so conserved will, at no distant date, be of considerable value for sawing, hewing, or splitting purposes, and the saplings suitable for telephone or telegraph poles, mining props, building blocks, etc. Any forest area in this State, held under *Conditional Purchase*, contains, as a rule, a certain percentage of valuable timber, often more than is required for timber improvements of such holdings; and if such area is required for grazing and not for cultivation, the conservation of valuable timbers when ring-barking is in course of progress should be aimed at with due regard to ultimate profit.

“In the Eastern States, owing to the depletion of timber on Crown lands and State forests near towns, sidings, and navigable rivers, the attention of timber contractors has been drawn to procuring timbers from private property under the royalty system. Thus to my certain knowledge, in cases too numerous to particularise, I have seen timbers on Conditional Purchase and other similar holdings sold to great advantage, and the revenue so derived has, in many instances, assisted settlers considerably in time of need, and aided them to improve their land to a much greater degree.

"The gradually increasing distance of cartage of timbers will certainly have a tendency to increase the price of such products; then, on holdings many miles away from sidings, where timbers have been intelligently conserved, the settlers will, less than a decade hence, in my opinion, receive a handsome return for their foresight.

"I can foresee that, in a few years' time, when the forests on the Goldfields and Yilgarn Railway lines are depleted of their timbers suitable for props, there will then be a tremendous drain on the forest supplies adjacent to the Eastern and South-Western lines for such timbers.

"I think that the foregoing report is worthy of consideration in connection with the ring-barking of timber on holdings under the control of the Agricultural Bank."

ROYAL AGRICULTURAL SHOW.

The *Western Mail* writing on the exhibits at the Royal Agricultural Show, held at Guildford the end of last month, says:—"A very attractive feature of the show was the exhibit of live stock by the Department of Agriculture. These included the roadster stallion "Kinrara," the Ayrshire bull "Hamilton," winner of the second prize at the Melbourne show against 66 competitors, three Ayrshire cows, one bull and three Dexter cows, three young Jersey bulls, three Berkshire and three Tamworth pigs. The Dexter cattle attracted a great deal of attention, being something entirely new to the majority of the people present. They are thick-set, sturdy little beggars, and look as good for beef as they are said to be for milk. They ought to suit many of the poorer districts of this State, where the feed is scarce, and where it is almost impossible to keep other breeds of cattle at a profit. The cows were bought up at once, notwithstanding the high prices that were asked for them, and it is said one of the purchasers was offered £15 on his bargain, but refused. The Berkshire pigs imported by the Department deserve special mention. The bringing of these pigs to this State opens up a new era in Berkshire breeding. We have had what were considered good the breed heretofore, but they fade into insignificance before the boar and two sows exhibited here. It is safe to say that a really typical Berkshire of the highest state of perfection had never been seen until these arrived, and no one who had not seen them could imagine that pigs could be brought to such a pitch of perfection and such a weight at twelve months old. They were a centre of attraction to all pig breeders, and the young pigs from them were all sold in a few hours for future delivery. One old pig breeder from the Eastern districts remarked that he had been

breeding pigs for the past 50 years, and could not have believed it possible to produce such a pig as one of these at any age, much less at 12 months old. He declared his intention of having one of the young ones at any price."

The following stock have been sold by the Department:— Purchased by the Hon. H. J. Saunders, Aryshire bull, "Hamilton"; Ayshire cow, "Julia 1st"; Berkshire boar, "San Toy"; two Berkshire sows, "Silver Bell" and "Mona." Purchased by Mr. W. Rose, Bunbury, two Kerry cows, "Denham Daisy" and "Dalyden." Purchased by Mr. A. Crawford, Kerry cow "Denmar." Purchased by Mr. T. M. Alcock, Tamworth sow, "Lady Melton." Purchased for the Rottneſt Eſtabliſhment, Tamworth sow, "Lady Knowle."

The entire "Kinrara" is now ſtanding at Preſton, Weſt Swan Road, Guildford, at a fee of £3 3s.

"LEIS CONFORMIS" IN WESTERN AUSTRALIA.

BY A. DESPEISSIS.

During laſt and alſo the preceding winter, Mr. A. M. Lea, Government Entomologiſt of Tasmania, took conſiderable pains to collect and ſhip to this Department colonies of the *leis conformis* ladybird, one of the moſt valued of the inſects of that tribe, and one which did not hitherto occur in Weſtern Australia.

Theſe colonies were liberated in orchards at Gingin, on the Swan, and at Wongong, on the Brunſwick.

A couple of days ago, when viſiting one of theſe orchards on the Swan, in company with Mr. Compère, we noticed ſpecimens of that beneficial inſect feeding on aphides on pear and on orange trees. It may, therefore, be ſaid to be now eſtabliſhed in Weſtern Australia; and, owing to the circumſtances that this ladybird has been introduced without any of the parasites which prey upon it in Tasmania, it is to be hoped it will firmly eſtabliſh itſelf, and greatly help in keeping in check aphides and ſcales which infeſt our orchard trees.

A circular letter addreſſed to owners of orchards where the *leis conformis* were liberated, aſking them to keep the Department informed as to whether this inſect has likewise eſtabliſhed itſelf amongſt their trees, would cauſe intereſting investigations to be made.

An enlarged illuſtration of that ladybird was given in laſt September's iſſue of the *Journal*.

Mr. Lea would, I dare ſay, feel intereſted.

HOW TO GET RID OF WOOLLY-APHIS.

Inspector Vaughan in his report to the Secretary of the Department of Agriculture, referring to the Woolly-aphis, says:— "Going recently through the orchard of Mr. W. Sounness, Marryup, Mount Barker, I was very much struck by the successful way he has fought and conquered that terrible pest the Woolly-aphis. In this orchard there are three or four acres of old trees that at one time must have been covered with the aphis. Mr. Sounness recognised he must be up and doing if he intended to extend his orchard and go in for fruit-growing on a large scale. So he set to work and sprayed them hot and sprayed them cold, and you might almost say sprayed them morning, noon, and night. The roots were uncovered; ashes, lime, etc., were put round them, and the aphis slowly disappeared. Castor oil is greatly believed in, and a pot and brush is always kept handy. The trees are constantly watched, and whenever any aphis appears the oil is promptly applied; but it has been got under so well that the pest has almost disappeared, and never once has it been allowed to get on to the young trees. Mr. Sounness is to be congratulated on the way he keeps his orchard, and it looks as if he will be again rewarded with an exceptionally big crop of fruit, especially apples."

THE FUTURE OF THE FRUIT INDUSTRY.

SECONDHAND FRUIT CASE.

THE MARKETING OF FRUIT.

At the annual conference of the Central Fruit Growers' Association of Victoria, Mr. Brewer, a well-known fruit-grower and expert, read an interesting paper on "The Future of the Fruit Industry," in which he dealt with several matters of great importance to those who are hoping to experience a great future for the industry. The paper read was as follows:—

"In writing this paper I do not desire to pose as an expert, but rather to place before our growers facts that I have gained by experience and observations I have made during the period I have been growing and exporting fruit. We have reached a period in trade when fancy prices can no longer be obtained, and, therefore, all our efforts must be concentrated in the endeavour to produce the best fruit at the lowest possible price, if growing for a living is to continue. At the present time many of us are paying for our want of certain knowledge when we were planting, for either we

are to a large extent trying to produce what is unsuited to our several localities, or we are growing kinds that are gone out of fashion, or, worse than all, growing what we never wanted, through getting trees not true to name; and these misfortunes, combined with the ravages of insect pests, make the fruit-growers' lot a not too happy one.

The first problem facing the intending fruit grower, or the grower desiring to enlarge his orchard, is "what to plant." To determine this we must endeavour to look into the future, and see what we have to compete against. I myself think that we are very near the time when we will have of necessity to enter the world's market; because we are now producing almost as much as we can consume in the Commonwealth, and each year's increase will force us to find markets further afield. We must, therefore, grow fruits of only the highest standard of quality, for anything lower will soon be forced out of the market, because its price will be so low that the expenses will swallow up the proceeds. To be successful we must grow only what suits our particular locality. Each has its own distinctive advantages of soil and climate. These we must study. We have a climate generally in this State of Victoria which enables us to produce fruit equal to anywhere on the earth's surface, but, unfortunately, it produces likewise orchard pests in similar measure, and if these are not kept under by persistent and intelligent efforts our business will be a failure. I frequently go through orchards in many districts which bear evidence of great labour being expended in destroying these orchard foes, and then on going into the fruit houses I find large quantities of fruit containing these pests being stored up, as it were, turning the houses into incubators to ensure getting a good supply for the future. One can readily see that by pursuing such a course of action only failure can result. It may seem hard to have to destroy fruit after it has been produced, but instant destruction of infected specimens is the only practical course to pursue against pests which have escaped the spray pump. Probably the principal factor in the spread of insect pests is the use, under present conditions, of secondhand cases. To be constantly using new cases, and practically giving them away, is a waste that cannot long be tolerated, and if the effective disinfection of secondhand cases were made compulsory before their re-use, this waste need not exist; and I would suggest that the time is most opportune at present to legislate to this end, by the addition of a clause giving effect to it in the Uniform Case Bill now in the Minister's hands.

The key of the position is how to bring it about without undue cost or trouble to the producer, and I think this can be done by having a dépôt at the principal distributing point, viz., Spencer Street station. This must be beside the rails, so that all cases going to the country would pass out of the road conveyance through the dépôt and on to the trucks at a minimum of cost. Should any factory desire to do so, I would allow it to have its disinfecting dépôt on its own premises, under effective safeguards and inspection, and local growers must be compelled to either pass their cases

through a central disinfecting depôt or disinfect their own, the sale of fruit in a case containing disease being constituted an offence. I would recommend, in furtherance of this plan, that in future we use better made cases that will stand handling and re-using. The first cost will be slightly greater, but the benefits derived will pay it many times over. The inferior cases which are now being made are as much a medium for damaging fruit as they are for containing it. To go into our wholesale markets and see the deterioration and consequent loss to the producer occasioned by the use of these cases, is simply a revelation. It spoils the sale, even at a greatly reduced price, which means that the producer has to suffer.

We need greater facilities for placing our fruit on the market, for the cost of freight and carriage is out of all proportion to the value of the product. We require in Melbourne our wholesale market to be in direct communication with our railways, and I see no reason why it should not be so. In Flinders Street, between King and William Streets, opposite the City Freezing Works, there is a large piece of land lying idle, and which is eminently suited for a central market. The line of rails supplying the freezing works has only to be extended and the communication is complete, and the Melbourne cartages and consequent handlings abolished. We fruit growers must act unitedly, and if we do we shall get what we want. At the close of a conference with our Minister of Agriculture some little time since, he remarked that if we unitedly made reasonable requests no Government would decline to grant them. I feel that it is only a reasonable request that our Government carry our fruit at wheat rates. The farmers organised, and in combination with their representatives in Parliament, induced the Government to reduce their freights by £50,000, and the concessions due to grain growers are more than due to fruit growers. Why? Because men in other callings have been induced to become orchardists, and fruit production has grown to its present proportions by the direct act of the State, and they having established the industry are in duty bound to furnish such support as will enable the fruit producer to make a living out of his produce. Another important reason is that an orchard once established must remain an orchard, because many years of labour have to be expended before a return can be obtained, whereas a farmer can change his product every year, and have a free choice of what appears to be the most profitable.

Why should we be compelled to pay rail freight on 100 miles at 14s. 11d. per ton, while the farmer gets his wheat carried over a similar distance for 8s. 4d., or a fraction over half, or if we take a 200 miles basis the wheat rate is 12s. 8d., while fruit rate is 24s. 1d.? Followed to oversea markets, the position becomes far worse, for ocean freight alone to London is 3s. 9d. per case, or more than the local value of the fruit. This is a serious position, in view of the fact that the London market, which our Government experts assured us is unlimited, is proving to be distinctly limited, and that limit, under present conditions, has been reached by the exporters of Australia. The season just closed reveals the fact that the

average price realised by exporters has not left them the local market rate for the fruit after deducting expenses. The net paying price for fruit in London is 11s. per case, made up as follows:—Expenses, 7s.; local market rate for export fruit, 4s.; total, 11s. By courtesy of the Minister of Agriculture I have obtained the data, which has enabled me to arrive at the exact average realised by Victorian apples in London. This average, based on a total of 21,268 cases, amounts to 10s. 7½d., or 4½d. below the net paying price. The Orient line boats, carrying a total of 7,216 cases, averaged 11s. 4d.; the P. and O. boats, with 7,260 cases, averaged 10s. 9½d., while the Holt line took 6,060 cases at an average of 9s. 7½d.

Victorian Exports of Apples to London—Season 1901.

Sailing Date.		Vessel.	No. of Cases.	Average.	
				s.	d.
Feb.	19	Ormuz	2,246	12	0
"	22	Sarpedon	603	11	4½
"	26	Arcadia	741	10	2½
Mar.	5	Oruba	492	12	6
"	12	Oceana	2,578	12	2½
"	19	Austral	2,494	11	9½
"	22	Hector	2,361	10	2
"	26	Britannia	1,821	11	1
"	29	Warrigal	733	7	6½
April	2	Cuzco	703	12	0½
"	9	Australia	1,481	12	5½
"	16	Omrah	1,281	8	4½
"	20	Orestes	3,096	7	4
"	23	Victoria	639	7	11½

The gravity of the position has only to be thought over to be realised, especially as there are no prospects of a recovery in prices. My private advice from London states: "The average level of prices this year has not been so high as last year, but the quantity of apples which has been on the market this season has been so largely in excess of previous seasons that, we think, on the whole we must consider the average satisfactory, thus indicating that any further increase in supply will result in a corresponding decrease in prices. To operate any more extensively on this market, we must either reduce the expenses or accept a lower rate for our fruit. We are producing for export, and export we must. I believe there is an unlimited market in London at from 7s. to 8s. per case, and when we can reduce expenses to 4s. or 5s. per case, we shall have that limitless market we have been taught to believe exists at past rates when securing ocean space and success went hand in hand.

I do not wish to be pessimistic in my view of the future, but I feel that producers must face conditions as they now exist, and to do that we must study present day events, and these I have endeavoured to place before you by means of absolute figures and actual results obtained.

INSECT PESTS ACT.

MONTHLY REPORT.

During the past month the work of inspecting orchards for disease has been rapidly proceeded with, the finer weather permitting the inspectors to get about the country with greater facility than in the winter months. A total of 137 orchards have been inspected in the country districts, the localities visited including Swan, Sawyer's Valley, Bayswater, Armadale, Kelnascott, Harvey, Albany, and Mount Barker. The San José scale (*Aspidiotus perniciosus*) was found in thirteen of the orchards examined, a total of 143 trees being affected. Of this number only eight trees were found to be severely infested, the disease in the majority of cases being described as so slight as to require very careful inspection to determine. Five of the above-mentioned infested orchards had not been previously examined, and in the remaining eight this disease had been found formerly. It is satisfactory to note that the treatment prescribed by this department in regard to these orchards has had the effect of considerably reducing the extent of the infestation, as will be seen from the fact that whereas these orchards now contain 100 diseased trees, a total of 276 affected trees were found in the same orchards less than twelve months ago.

In addition to the foregoing, twelve orchards, which formerly contained a total of 151 trees affected with San José scale, were inspected, and found to be free from the pest, among these being two orchards in which the scale had at one time secured a firm hold. The orchardists in these cases, by diligent attention to the treatment prescribed, have been able to rid their orchards of this most troublesome disease.

The existence of a scale insect on vines in Adelaide Terrace was reported to this Department, and a careful inspection of all gardens in that locality and other parts of the city has been made. Notices have been issued to eradicate the scale wherever it has been discovered, and it is pleasing to be able to say that in nearly every case the work of cleansing the vines and other plants has been promptly and effectively carried out.

A daily examination is made of all fruit passing through the auction-rooms, and frequent visits are paid to the fruit shops in the city and suburbs for the purpose of preventing the sale of diseased fruit.

G. BUCHANAN,

Acting Chief Inspector.

6th November, 1901.

CULTIVATION OF ORANGES.

By F. E. H. W. KRICHAUFF, Chairman Central Agricultural Bureau, S.A.

Although the whole of the citrus tribe prefer a sweet friable soil of good depth and moisture, without being too wet, or planted in holes that prove to be stagnant puddles unable to drain themselves, the soil is of less importance than irrigation or manuring; only an excess of moistures causes too often disease of the roots; but moderate irrigation, and manuring liberally and regularly, will induce orange trees to become profitable.

Senor Alino, F.R.H.S., of Valencia, Spain, says an acre planted with orange trees may produce 26,500lbs. of fruit, and such a crop probably contains 100lbs. of nitrogen, the same of potash, 105lbs. of phosphoric acid, and 220lbs. of lime, not counting wood and leaves. It is therefore absolutely necessary, to give compensatory fertilisers, although somewhat modified in accordance with the soil and its constituents. A clay soil, although poor in phosphoric acid, most likely does not require the whole of the potash returned for some years, as might be necessary for a soil rich in lime and phosphoric acid. Gypsum reduces a soil rich in potash to a fit state for its absorption, and a smaller quantity of this fertiliser may therefore become necessary. Sandy soils are generally poor in plant food, and require all of them—after such a crop, at all events. Senor Alino, however, says that an excess of phosphoric acid results in many but small fruits, well flavoured, with a thin skin; and trees that are shy bearers may therefore require more of a phosphatic manure. Potash makes the fruit even more sweet and juicy, while too much nitrogen produces much wood and foliage, but coarse, thick-skinned, late ripening fruits, containing little sugar or aroma, and they do not keep well.

It is admitted that dung and other organic manures are useful as an aid to commercial fertilisers, which, however, are so much quicker consumed, but it is not advisable to give horse-dung more frequently than once in three years. Orange trees are never quite without a movement of sap at any time of the year, and apparently require plant food to be given more than once a year, especially nitrogen, although once is sufficient for most other fruit trees.

Senor Alino wants a deep annual ploughing, which it seems to me must injure the large number of fibrous roots which, here at least, are generally found to be near the surface. When manuring, a slight stirring of the surface by a four-pronged fork seems to me far better, and does not necessitate trimmed-up trees to enable ploughs to run near the stems. Low branches are good protection of the trunk against our frequently too powerful sun. He forms round holes around his trees, and says that neither water nor

manure should be allowed to enter. This certainly is a statement which has surprised me and probably most of our orange growers, as our circle formed around a tree was expressly made to water it better. He warns orchardists also to spread fertilisers not within a hand-breadth around the trunks.

Young trees require per acre 325lbs. of nitrate of soda (or an equivalent of 260lbs. of sulphate of ammonia), 264lbs. of a phosphatic manure and 60lbs. of sulphate of potash in preference to muriate of potash. For old trees in full bearing, 350lbs. of sulphate of ammonia, or 440lbs. of nitrate of soda, 600lbs. of superphosphate of lime and 80lbs. of sulphate of potash may be required. If nitrate of soda is to be used, Thomas phosphate should be applied as phosphatic fertiliser. Lime, although it may be required, should not be given with the above fertiliser; either some time before or later. It is, however, well to apply perhaps both forms of nitrogen—namely, one-half of the doses of sulphate of ammonia in our winter, and one-half of the nitrate of soda three months later, when such division of the nitrogen may prevent the dropping of the young fruit. If the trees are not vigorous give but little potash; if too luxuriant, with few fruits, omit the nitrogen and give more superphosphate. In the United States a fertiliser is used consisting of four cent. ammonia, five to six per cent. phosphoric acid, and thirteen per cent. potash, spread broadcast twice a year, with great results.—*S.A. Journal of Agriculture*.

CULTIVATION OF OYSTER SHELL.

Some years ago, at the instance of Messrs. Broadhurst, McNeil, & Co., the Government of the day sent Mr. Saville-Kent to inspect the waters of the Abrolhos with a view to the cultivation there of the Nor'-West coast variety of m.o.p. shell. This expert reported in favour of the experiment, and some of the Nor'-West pearl oysters were deposited in the shoal waters of the Pelsart lagoon. Mr. Broadhurst, while recently visiting the islands, had as company the Rev. P. U. Henn, who was collecting conchological specimens for the Sydney Museum. This gentleman picked up a young live m.o.p. shell, and Mr. Broadhurst sent the specimen away for expert examination, and it has been pronounced a true Nor'-West shell (*Meleagrina margaritifera*), and identical with those planted by Mr. Saville-Kent. There are doubtless many others there by this time, and the above discovery tends to show that the Nor'-West shell will thrive in the Abrolhos waters.—*Morning Herald*.

GARDEN NOTES FOR NOVEMBER.

PERCY G. WICKEN.

The warm weather is again with us, and the rains are likely to cease for the summer months. Those who have established a system of irrigation are likely to reap the benefit of their enterprise; others who have no means of artificially watering their crops must devote their attention to retaining what moisture they have in the soil, by means of incessant cultivation. The horse or hand hoe, as the case may be, must be kept constantly going and the surface soil well stirred; this causes it to act as a mulch and prevents the moisture in the sub-soil from evaporating. All weeds must be kept cut down as they only draw moisture from the soil, which is required by the growing crop. The soil should never be allowed to cake. A light harrowing will not do any harm after the seeds are up, but when the plants begin to get large the horse hoe must be used between the rows. In the vegetable garden a mulching of straw, stable manure, bush rakings, or any suitable substance placed around the plants and between the rows is a great help in keeping the ground moist; at the end of the season it can be dug in, and acts as a manure for the following year. Work the ground as deeply as possible, and if transplanting any young plants, they require to be shaded by strips of bark or other material until they are established.

BEANS (French or Kidney).—This vegetable does very well during the hot weather so long as there is sufficient moisture in the ground. Just before the plants come into flower it is advisable to apply a top dressing of a little sulphate of potash and superphosphate, mixed together in the proportion of 1 of sulphate to 2 of superphosphate. This manure should be dusted along the rows, and then the plants hilled up.

BEANS (Lima).—This variety of bean may still be planted, and should be extensively sown. There are both climbing and dwarf varieties, and they are very prolific. The climbing varieties can either be staked or allowed to run over the ground the same as cow peas.

BEANS (Madagascar).—These beans should now be ready for staking; they are splendid climbers, and are ornamental as well as useful.

BEET (Red).—This vegetable is generally in favour during the summer months, as it is both palatable and cooling. There is a globe variety, which is perhaps easier to raise than the long variety.

BEET (Silver).—Those in the seed bed should be ready to plant out, and a little more seed may be sown for future use. They require plenty of manure. The outside leaves should always be taken off as required, and they continue to produce fresh leaves for a long period.

CABBAGE.—Plant out any young plants that are ready, and sow a little seed for future use. Grubs are likely to become troublesome at this time of the year. The best remedy is to spray the plants with a mixture of Paris green and water, to which is added a little lime; 1lb. of Paris green to 200gal. of water, and about $\frac{1}{2}$ lb. of lime, well stirred in. Keep the mixture well stirred while spraying.

CARROTS.—A few rows may be sown to keep up a supply, and those already coming up must be kept free from weeds.

CELERY.—Sow a little seed in a box or seed bed, and plant out any plants that may be ready. Celery requires to be well manured, and must be hilled up as soon as the plants attain any size and care taken that no dirt gets between the stalks.

CUCUMBERS.—Those already sown should be well forward; a little more seed may be sown for future use. It is advisable to pinch off any straggling growths.

MAIZE (Sweet).—This is a very wholesome but much neglected vegetable. Seed may be sown any time during the month. The Sweet Maize are mostly dwarf varieties, and may be sown in drills about two feet apart, one foot apart in the drills.

MELONS.—Those sown early in the season should now be well forward. A few more may be sown for later crops.

PUMPKINS.—A few of the earlier varieties should be ready for cutting this month. The best variety to sow this month is the Rio or Bugle Pumpkin; they are very good for pies and preserves.

SWEET POTATOES.—Cuttings from those planted in the seed bed should now be ready for planting out; they should be put out on ridges three feet apart. Full particulars as to the cultivation of this crop will be found in August issue of the *Journal*.

TOMATOES.—Those sown early should now be doing well, and in some parts they will require staking. Tomatoes are already coming into the market from the warmer parts of the State. Plant out all available plants as soon as possible; they require to be heavily manured. Well-rotted stable manure is the best if it can be obtained, otherwise an artificial manure, rich in nitrogen and potash, must be applied.

FARM.—This is one of the busiest months of the year on the farm. In the earlier districts hay-making is in full swing; and indications tend to show that there will be a larger area than ever of cereal crops cut for hay. The average taken all through will, I think, be found up to the usual standard. The Eastern districts have experienced a somewhat dry season, while the South-West districts have a season about the average. Those who intend leaving their crops for grain should take every reasonable precaution against fire. It is often advisable to cut the outside strip round the paddocks for hay, and to run the plough or scarifiers round the strip thus cleared,

which will act as a firebreak. Those who have not already done so should look to their reapers, and see that all harvesting machinery is in good order for an immediate start. Where the land is not too dry such crops as cow pea, Lima beans, sorghums, millets, and soy beans may be sown during the month, and also maize, for green feed.

ANSWERS TO CORRESPONDENTS.

Messrs. F. and C. Piesse, Katanning, write:—"In answer to yours of 29th ult. (No. 94), I herewith enclose specimens of aphid-eaters. These made their appearance soon after the unclosing of young foliage on any tree infested with aphid. Never having seen them before, I watched them carefully, and, under the glass, could see them even in their earliest stage eating the aphid greedily. Two or three sucks, and the aphid was dropped and another caught, so the destruction caused by one parasite is very great. Specimens enclosed are from small to medium size, but have found them earlier in season up to half-an-inch long. The parasites in their turn are preyed upon by the enclosed bug, which pierces them through with the spike carried doubled back under his head. One of these bugs will quickly clear a small tree of leaf-eating caterpillars. The enclosed eggs I have found on trees infested with the parasites, and would like to know if they are hatched from same." The matter being referred to the Entomologist of the Department of Agriculture, Mr. Compère replies:—" (1.) With reference to the aphid-feeders sent in at your request by Messrs. F. and C. Piesse from Katanning, they are the larva of *Syrphus*-flies, family *Syrphidæ*. This is a very large family, more than two thousand species being known, and the specimens sent belong to the genus *Syrphus*, the larva of which live and feed upon aphid of various species, and do much good by destroying whole colonies of these pests at times, and are recorded from various parts of the world. (2.) The specimen of bug sent in, and reported as destroying these aphid-feeders, is what is commonly called the soldier bug, and is both beneficial and destructive. They live by sucking the blood of other insects, and do not discriminate between beneficial and harmful ones, and the eggs sent in are no doubt the eggs of this soldier bug, as they lay their eggs upon the underside of leaves, sometimes in clusters and sometimes in rows. (3.) The larva of these *Syrphus*-flies can be noticed at the present time in various parts of this city, feeding upon aphid."

Mr. W. S. Hales, Bunbury, writes:—"I am sending you a letter received from Mr. Jas. Jeffrey, also specimens of the bot referred to. I should be obliged if you would advise me of the proper methods of treating horses that may be infected with this wretched fly. I have seen the eggs under the chin of my own horse and washed them off with kerosene; but when the animal has the fly as Mr. Jeffrey reports, can anything be done to remove the trouble? The following is the letter from Mr. Jeffrey referred to:—"I am sending under separate cover a packet of bots, about 300. I got them from a valuable young mare of mine, which died on October 14th. I had been treating her for colic. After she died I opened her, and found a very large number of these pests attached to the bowels and stomach. Those sent are only about half the number I found. One of my other horses is now suffering from the same symptoms as the one had that died—that is, the head drooping, and, if she moves anyway quickly, has got a slight cough. If you can let me know of anything that will kill the worm without hurting the horse I will be thankful." The matter being referred to the Govern-

ment Veterinary Surgeon, Mr. Weir replied:—"Give the following, in the form of a ball:—Aloes, 2 drams; asafoetida, 2 drams; spirits of turpentine, 2 ounces. This can be given in the evening. The morning following give aloes, 6 drams; raw linseed, 6 ounces."

A. Mugg, Mount Barker, writes:—"I shall be much obliged if, through your journal, you would answer the following questions: (1.) Has the sire to be donkey or pony? If the former, would the ordinary scrub pony breed a good enough animal to find a market? (2.) Would it be possible to procure, at a reasonable price, a suitable sire. If so, please give me an idea as to price, and when I could get same?" The matter being referred to the Field Officer, Mr. Wicken replies:—"The sire for mule-breeding has to be a Jack donkey. Any hardy well-bred mare is suitable for mule-breeding. Jack donkeys are rather scarce in these States, and hard to obtain. Some time ago the Queensland Investment and Land Mortgage Co., Brisbane, offered for sale a young stallion ass at £25. Messrs. Elder, Smith, & Co., of Adelaide, write as follows:—"It is rather a difficult matter to procure Jack donkeys that are guaranteed to cover mares. The Beltana Pastoral Co. advise that they have no donkeys that they can sell with a guarantee, but they will offer Jack donkeys, about 12 months old, at 4 guineas per head on trucks at Beltana.'"

MARKET REPORT.

FOR MONTH ENDING NOVEMBER 14.

W.A. General Produce Company, of Perth, report sales effected for the month ending November 14:—

Sales during the past month showed a marked advance for the better than has been the case of late. Supplies of farm and dairy produce very much on the increase, especially chaff, potatoes, onions, butter, etc. Fruit, imported: Some rather heavy consignments of late, and selling to the disadvantage of the importers. Local, mostly confined to loquats, strawberries, and Cape gooseberries. Vegetables: Some excellent samples of early summer lots realising very good prices. In salads and herbs, the former fairly good supplies; as for the latter, we have an opening for large quantities. Poultry: Without a doubt, a splendid outlet exists just now: and we advise holders not to delay sending in consignments and avoid the usual glut about Christmas time.

Farm and Dairy Produce.—Bacon—sides and rolls—supplies very good, with demand daily increasing; hams, very scarce indeed, both on spot and New Zealand and Victoria; several orders have been refused. Butter, a good bit of local dairy coming in just now, but unfortunately not giving satisfaction; lard, a small consignment just to hand, which will find ready outlet; cheese, stocks on spot very scarce, values hardening very much; eggs, local, supplies shrinking considerably, values as a natural consequence increasing; potatoes, local, new, supplying all the demand, consignments arriving regularly; onions, some Californians still about, likewise a consignment of South Australian just landed in good order; chaff, supplies very good, values normal; bran and pollard in splendid demand, stocks on spot not heavy, values must further advance; flour, local lots are again offering freely; oats are now being quoted slightly easier, f.o.b. Tasmania; maize, demand for poultry in its crushed state only; wheat, supplies getting short, but soon new crop will be available; oil cake in exceptionally good demand.

Fruit.—Oranges, imported lots, still heavy, selling below landed cost; lemons, in splendid demand, realising good prices; loquats, few coming in, selling well; cherries, consignments of South Australia just landed in very fair order, sold readily; bananas, very good supplies, selling at moderate prices; Cape gooseberries, sound lots find ready outlet; strawberries, fairly plentiful, selling at very reasonable rates, and ought to be within the reach of the majority.

Vegetables.—Cabbages, some very fine lots arriving just now, selling well; carrots and parsnips, the quality of both arriving just now is all that could be desired, especially the latter, some very fine specimens; turnips, if good and sound, sell fairly well; beans, broad and French, very good supplies, selling at moderate rates; peas, some very heavy consignments arriving of late, selling at all prices, according to quality and condition; rhubarb, very good supplies coming along, finding good outlet.

Salads and Herbs.—Lettuce and spring onions, for fresh tender lots fair prices obtained; beetroot in constant demand for well-grown lots; cucumber, increasing supply daily, selling very well; tomatoes, supplies forward are realising good prices; celery, for young fresh lots good prices obtained; cress, usual supply and demand; thyme, marjoram, sage, mint, very good outlet for all herbs in large quantities if nice dry leaf is sent to market.

Poultry.—Fowls, for prime table very high prices realised, and demand still good; chickens, also in very good demand; ducks, more plentiful than hitherto, selling very well; ducklings are in want if fit to kill; geese, in exceptionally good demand, goslings likewise; turkeys, gobblers in good condition, some which came forward sold well.

Carcase Meat.—Pork in demand if it can arrive fresh; mutton, lamb, beef, veal, live stock wanted.

Sundries.—Bonedust, phsophate, guano, in these lines very little doing just now; coarse bacon salt good stocks available; corn sacks and bran bags both in new and second hands have done fairly large business.

NOTICE TO SUBSCRIBERS.

Subscriptions for the year 1902 will be due next month (December), and must be paid on or before 1st January, 1902, otherwise names will be struck off the lists.

BACK NUMBER OF JOURNAL REQUIRED.

Any person having a copy or copies of the January issue of this year, 1901, of the *Journal*, will oblige by sending same in to the Editor, Department of Agriculture, Perth. Sixpence will be paid for each copy.

SECOND

NATIONAL SHOW OF PRODUCE.

IN order to show the great progress made in Agriculture during recent years, it has been decided by the Hon. Minister for Lands to again hold a National Show in Perth next March. Prizes are to be given for the best collection of farm produce exhibited by groups of Agricultural Societies, and also for the best exhibits of manufactured articles made from locally grown products.

1. CHAMPION PRIZE.

(DISTRICT EXHIBIT.)

Best collection of Farm, Garden, and Orchard produce, comprising everything grown, produced, and made on a farm. First prize, £40; second prize, £20; third prize, £10.

The exhibit to be collected by the Agricultural Societies from produce grown within the boundaries of their respective districts, as defined on pages 8 and 9, and to be displayed by them. Should they be called upon to do so by the Judges, the Secretaries of the Societies, or the person placed in charge of the exhibits, shall make a declaration that all the exhibits have been grown or produced within their respective districts.

In order to encourage individuals to contribute to the district collection, first, second, and third class certificates of merit will be issued by the Department for the best exhibits in each class. For this purpose the exhibits in the district collections may be labelled with the name (or number) of the grower.

The certificates will be given for the best exhibits in each class, irrespective of the district, such as the best pumpkins, best sample of wheat, etc., and need not necessarily be contained in the best district collection.

The prize money will be paid by the Department to whomsoever the Societies nominate to receive it, but this nomination must be sent to the Secretary, with the detailed entries, not later than February 1st.

The medals and certificates will be distributed per medium of the Agricultural Societies.

MANUFACTURED GOODS.

EDIBLE.

Class 2. Best exhibit of—

- A. Jams and Preserves.
- B. Sauces and Pickles.
- C. Flour.
- D. Wine.
- E. Honey and Bee Products.
- F. Butter.
- G. Bacon.
- H. Miscellaneous.

First prize, silver medal ; second and third class certificates.

NON-EDIBLE.

Class 3. Best exhibit of—

Manufactured from produce of West Australian soil (minerals excluded).

- A. Articles manufactured from local timber.
- B. Brushware.
- C. Fruit cases and shooks.
- D. Soap and Candles.
- E. Miscellaneous.

First prize, silver medal ; second and third class certificates.

POULTRY APPLIANCES.

Class 4. Best collection of Poultry-keeping Appliances. First prize, certificate ; second prize certificate.

BEE APPLIANCES.

Class 5. Best collection of Bee-keeping Appliances. First prize, certificate ; second prize, certificate.

SPRAYING APPARATUS.

Class 6. Best collection of Spraying Apparatus. First prize certificate ; second prize, certificate.

MANURES.

Class 7. Best collection of Manures, to be in stoppered bottles, to contain about 7lbs. each, with analysis attached. First prize, certificate ; second prize, certificate.

CLASSES 2 AND 3.—The articles to be manufactured by the exhibitor or through the agency of the firms competing. Should they be required to do so by the Judges, the exhibitor, or in the case of a firm, the manager, shall make a declaration that all the articles have been made by himself, or his firm, from agricultural produce raised in West Australia.

BOTANICAL.

POISON PLANTS.

- Class 8. Best collection of West Australian Poison Plants. (Pressed.)
First prize, certificate; second prize, certificate.

NATIVE GRASSES.

- Class 9. Best collection of native Grasses. (Pressed.) First prize, certificate; second prize, certificate.

SALTBUSHES.

- Class 10. Best collection of native Saltbushes. (Pressed.) First prize, certificate; second prize, certificate.

FODDER PLANTS.

- Class 11. Best collection of native Fodder Plants, not including grasses. (Pressed.) First prize, certificate; second prize, certificate.

WOOL.

- Class 12. Best three fleeces of—
A. Merino ewe's wool.
B. Merino ram's wool.
C. Merino lamb's wool.
D. Shropshire Down wool.
E. Long-wool sheep.
F. Cross-bred sheep.

The breed of the sheep, sex and age, and the number of days' growth of wool to be stated in each case. First prize, silver medal; second prize, certificate.

Railway freights from station of departure to Perth will be defrayed by the Department on all produce sent by the Agricultural Societies for competition, but no return freights will be paid on unsold exhibits. The Department will receive and store exhibits at Perth if duly notified beforehand, and will take every care, but will not accept any risk. The Secretary of the Department of Agriculture reserves the right of rejecting any exhibit not considered suitable. All exhibits must be addressed as follows. (Proper labels will be supplied free if application is made to the Secretary of the Department of Agriculture, Perth) :—

NATIONAL SHOW, 1902.

To the Manager, Government Refrigerating Works (Siding), Perth.
From—

Name in full.....
Address.....
Nature of contents to
be fully specified, giving {
name, variety, and date
of packing if fruit or }
other perishable produce

All table and necessary accommodation for the display of exhibits will be provided free of charge, but all exhibits must be displayed by the competitors at their own expense in the space allotted for that purpose by the Department. A limited number of free railway passes (return) will be granted to each district exhibiting, to enable representatives to attend and arrange their respective courts.

To encourage country societies to make a good exhibit of perishable produce, a certain space, if available, in the Government Refrigerating Stores will be set apart for the purpose of keeping perishable products, and on each district notifying their intention of competing, a reasonable amount of exhibits will be stored for them *free of charge*, the Secretary, Department of Agriculture, reserving the right of limiting or rejecting any exhibit which, in his opinion, may not be worth the expense of cold storage.

Societies will be allowed to exhibit a reasonable number of bags of grain, or other heavy produce, such as potatoes, roots, etc., and can collect from the farmers of their district, but will be limited to one bag from each farmer of each class of grain. The Department will not pay freight on more than one ton of flour from any one mill.

All Societies intending to exhibit must notify the Secretary, Department of Agriculture, by December 1st, as to their intention to exhibit, so as to enable arrangements to be made for a hall, and all entries in detail must be in the hands of the Secretary by February 1st, 1902.

The decision of the Judge or Judges to be final.

For the purposes of the competition for the Champion prize, the State has been divided into 15 districts, and the societies within each district should combine together and make one large exhibit. Each exhibit will be placarded Blackwood, Beverley, Northam, etc., as the case may be. A list of the Societies in each district is appended.

Efforts will be made to arrange excursion trains from the country, so that all may see the exhibition.

A sale of produce will be arranged by the Government auctioneer after the exhibition, and anyone desiring to sell their exhibits may do so by paying the auctioneer's commission. The Department will not be in any way responsible for the exhibits after the close of the exhibition, nor for the sale or collection of money for which exhibits may have been sold.

On no account must perishable produce be packed with other classes of exhibits.

The co-operation of all societies is invited so as to make a good show, and thereby to stimulate the demand for West Australian produce.

All exhibits must be forwarded so as to arrive at the Hall by 6 p.m. on the day previous to the show.

Any further particulars can be obtained on application to the Secretary, Department of Agriculture.

LIST OF EXHIBITS WHICH IT IS SUGGESTED MIGHT BE COLLECTED BY THE SOCIETIES COMPETING FOR THE CHAMPION PRIZE :—

COLLECTION OF GRAINS.—Wheat, Oats, Barley, Rye, Maize, etc.

COLLECTION OF ALL KINDS OF SEEDS :—

Beans and Peas, Cow Pea, etc., both as green feed, hay and seed.

Rock, Preserving, and Water Melons, Pumpkins, Marrows, Squashes, Cucumbers, etc.

ROOT CROPS.—Sugar Beets, Turnips, Swedes, Kohl Rabi, Mangels, Potatoes, Sweet Potatoes, Yams.

HAY AND CHAFF.—Lucerne, Wheaten, Oaten, Millet, Grass, Mixed, both bale and sheaf.

ENSILAGE.—Sweet and sour, chaffed and whole.

FODDER.—Sorghums, Millets, Lucerne, Green Maize, Teosinte, Tree Lucerne, Lupins, Cabbage, Kale, Rape, Mustard.

MISCELLANEOUS CROPS.—Buckwheat, Ramie, Jute, Broom Millet, Peanuts, Arrowroot, Indigo, Sunflower, Cassava, Tumeric, Tobacco, etc., etc.

VEGETABLES.—Cabbage, Beans, Peas, Tomatoes, Asparagus, Cauliflower, Chilies, Leeks, Parsnips, Carrots, Rhubarb, Turnips, etc.

FRUIT AND GRAPES of all kinds, both fresh, dried, and preserved.

Honey, Eggs, Butter, Cheese, Bacon, Lard.

HOME MADE Jams, Jellies, Pickles, Vinegar, Wine, Bottled Fruits, Sauces, Arrowroot, Millet Brooms, Fibre, Tobacco, Candied Peel.

LIST OF EXHIBITS WHICH IT IS SUGGESTED MIGHT BE COLLECTED BY FIRMS COMPETING FOR THE PRIZES FOR EDIBLE PRODUCTS.

Collections of Jams, Jellies, Sauces, bottled : tinned and dried Fruits, Vinegar, Candied Peel, Wines, Arrowroot, Tapioca, Butter, Cheese, Bacon, Ham, Lard, Honey, Wax, Bread, Maize Meal, Oatmeal.

LIST OF EXHIBITS WHICH IT IS SUGGESTED MIGHT BE COLLECTED BY FIRMS COMPETING FOR THE PRIZES FOR NON-EDIBLE PRODUCTS.

Collection of articles made from local Timbers, Handles for Tools, etc. ; Brooms and Brushes made from Millet and Fibres, collection of Fibres ; Gums, Resins, Tobacco, Dyes, Oils, Leather, Wool, Basil, Cotton, Soap, Candles, etc.

For the purpose of the Exhibition, Societies are divided into districts, as follows :—

BLACKWOOD.

Balingup Farmers' Association.

Lower Blackwood Farmers' and Graziers' Association.

Nelson Agricultural Society.
 Upper Blackwood Agricultural Society.
 Boyup Brook Agricultural and Vigilance Committee.

FREMANTLE.

Coogee Agricultural and Horticultural Society.
 Jandakot Agricultural Society.
 Walliabup Progress and Horticultural Society.

MURRAY.

Armadale Progress Association.
 Drakesbrook Agricultural Association.
 Murray Horticultural Society.
 Murray District Farmers' and Fruitgrowers' Co-operative Association.
 Waigerup Agricultural Hall Association.
 West Coolup Agricultural Society.
 Jarrahdale District Agricultural Society.
 Kelmscott Horticultural and Agricultural Society.

PLANTAGENET.

Albany and King's River Settlers' Association.
 Albany Agricultural and Horticultural Society.
 Albany and District Settlers' Association.
 Mt. Barker District Settlers' Association.

ESPERANCE.

Esperance Agricultural and Horticultural Society.

SUSSEX.

Newtown Farmers' Progress Association.
 Quindalup Progress Association.
 Southern Districts Agricultural Society.
 Wonnerup Progress Association.

SWAN.

Darling Range Vine and Fruitgrowers' Association.
 Wanneroo Farmers' and Gardeners' Association.

TOODYAY.

Deepdale Farmers' and Fruitgrowers' Association.
 Moora Farmers' and Progress Association.
 Newcastle Branch Bureau.
 Toodyay Agricultural Society.
 Toodyay Vine and Fruitgrowers' Association.
 Victoria Plains Farmers' Association.

NORTHAM.

Goomalling Farmers' Club.
 Greenhills Farmers' Club.
 Jennapullen Agricultural Society.

Jurakine Agricultural Association.
 Northam Agricultural Society.
 Wongamine Farmers' Club.

VICTORIA.

Greenough Farmers' Club.
 Greenough Farmers' Association.
 Geraldton Agricultural and Horticultural Society.
 Irwin Agricultural Society.
 Chapman Farmers' Association.
 Upper Chapman Farmers' and Fruitgrowers' Association.

WELLINGTON.

Capel Farmers' Association.
 Brunswick Farmers' Club
 Harvey Farmers' Club.
 Harvey Agricultural Alliance.
 Boyanup Farmers' and Progress Association.
 Cookernup Farmers' Progress Association
 Donnybrook Progress Association.
 Ferguson Farmers' Association.
 Preston Progress Association.
 Thomson's Brook Progress Association.
 Wellington Pastoral and Agricultural Society.
 Waterloo Farmers' Protection Association.

WILLIAMS.

Kojonup Agricultural and Horticultural Society.
 Wandering District Agricultural Society.
 Williams Agricultural Society.

GREAT SOUTHERN RAILWAY.

Great Southern Pastoral and Agricultural Society.
 Narrogin Agricultural Alliance.
 Wagin and Arthur District Agricultural, Horticultural, and
 Industrial Society.
 Marbellup and District Settlers' Association.

YORK.

York Agricultural Society.

BEVERLEY.

Beverley Agricultural Society.
 Pingelly and Momambine Agricultural Society.

THE CLIMATE OF WESTERN AUSTRALIA DURING OCTOBER, 1901.

The month was characterised, on the whole, by moderately high barometers and temperature and scanty rainfall. The only portion of the State where rain was expected in October was the South-West triangle between Geraldton, Leeuwin, and Esperance, and there it was considerably below the average for previous years. Elsewhere only a few showers were recorded here and there, as usual, the quantity increasing from *nil* in the tropics to about an inch along the South-East coast.

In South-West districts the weather was mostly spring-like and delightful, but on the Goldfields the advent of summer is already announced by severe dust storms and occasional hot days, the highest temperature recorded being 102·3 at Laverton. A very decided increase in the average maximum day temperature is indicated, as usual, from the sea-coast Eastwards, and a gradual diminution in the night temperature as far as York. This will be seen at a glance, in the following table:—

	Mean max.	Mean min.
Rottnest ...	67·7	56·9
Fremantle ...	68·0	56·0
Perth Observatory	70·8	54·1
Perth Gardens ...	73·7	53·8
Guildford ...	74·8	51·8
York ...	77·0	45·9
Southern Cross ...	80·8	50·6
Coolgardie ...	79·5	52·1

There were only two remarkable features in the daily weather noted during the month, viz. (1st), the formation of an unusually severe "low" near Tasmania (Hobart barometer falling to 28·57), on the morning of the 28th, accompanied by the building up of a "high" over the Southern portions of Western Australia, with strong South to East winds throughout this State, and very heavy weather off the Victorian and Tasmanian coasts; the occurrence of a moderate gale at Fremantle on the evening and night of the 31st.

The Climate of Western Australia during October, 1901.

Locality.	Barometer (corrected and reduced to sea level).				Shade Temperatures.						Rainfall.			
	*Average for previous years.				October, 1901.									
					Mean.			Highest.	Lowest.	* Average for previous Years.				
					Max.	Min.	Month.							
Mean of 9 a.m. and 3 p.m.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever re-corded.	Lowest ever re-corded.	Points in-h in Month).	Total Points since Jan. 1.	
NORTH-WEST AND NORTH COAST:														
Wyndham	29-891	30-045	29-714	96-9	78-3	87-6	109-0	71-2	100-3	78-9	111-0	68-0	Nil	1575
Derby ...	29-904	30-040	29-825	97-2	68-6	82-9	103-0	58-6	96-4	73-0	112-0	60-0	Nil	1066
Broome	29-920	30-032	29-793	92-3	68-4	80-4	101-5	60-5	90-2	69-6	108-6	55-0	Nil	3205
Condon	29-961	29-936	30-178	92-5	59-4	76-0	102-2	57-8	90-0	63-1	108-2	49-0	Nil	2445
Cossack	29-986	29-923	30-219	92-9	65-5	79-2	104-1	57-8	91-3	69-9	110-5	54-0	Nil	800
Onslow	29-984	29-993	29-798	88-4	60-1	74-2	98-8	54-8	89-5	58-9	113-0	48-0	Nil	250
Carnarvon	30-040	30-010	29-787	79-9	61-2	70-6	94-4	54-6	80-7	59-3	105-0	45-0	24	583
Hamelin Pool.	30-046	...	30-371	29-853	82-6	58-2	94-4	48-0	80-5	53-6	97-0	44-6	Nil	457
Geraldton	30-082	30-391	29-796	73-0	55-3	64-2	88-0	48-1	73-2	54-1	100-0	40-0	25	1844
INLAND :														
Hall's Creek	...	30-058	29-692	97-0	65-4	81-2	103-8	48-6	...	...	...	...	Nil	1546
Marble Bar	...	...	...	98-7	65-8	82-2	107-5	51-2	...	...	...	...	Nil	1883
Nullagine	29-936	30-234	29-680	95-0	60-0	77-6	104-0	50-0	...	...	...	...	Nil	1824
Peak Hill	29-988	30-311	29-743	85-0	59-9	72-4	96-3	47-2	...	...	...	...	35	724
Wiluna	...	...	...	85-3	56-6	71-0	98-2	39-1	...	...	...	...	...	...
Cue	30-026	30-378	29-766	85-2	56-4	70-8	99-0	42-5	81-5	54-0	96-0	41-5	2	449
Yalgoo	30-008	29-990	29-683	83-7	54-7	69-2	95-0	42-0	79-4	52-7	98-0	41-0	4	431
Lawlers	30-062	30-356	29-710	84-3	57-6	71-0	93-4	43-2	...	...	...	...	11	650
Laverton	30-038	30-368	29-794	83-3	53-3	68-3	102-3	39-0	...	...	...	...	27	700
Manzies	30-040	29-950	29-647	80-6	55-0	67-8	99-0	42-0	79-3	52-6	95-1	41-1	16	692
Kalgoorlie	30-046	29-952	30-421	29-704	78-9	66-2	97-6	40-5	77-3	52-7	92-4	41-0	49	766
Coolgardie	30-040	...	30-378	79-5	52-1	65-8	98-8	40-0	78-0	51-0	91-9	40-5	19	663
Southern Cross	30-030	29-952	30-396	29-645	80-8	50-6	65-7	97-8	78-9	48-7	107-0	36-1	7	723
Northam	...	...	...	...	...	...	...	...	...	...	...	...	40	1146
York	30-083	30-033	30-450	29-714	45-9	61-0	90-7	36-8	73-2	49-2	98-0	34-0	33	1277
Guildford	...	...	...	74-8	52-8	63-3	89-8	42-0	...	...	...	...	224	2999

* The figures for previous years have been given whenever there are at least three years complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

The Climate of Western Australia during October, 1901—continued.

Locality.	Barometer (corrected and reduced to sea level.)				Shade Temperatures.						Rainfall.			
	Mean of 9 a.m. and 3 p.m.	* Average for previous years.	Highest for Month.	Lowest for Month.	October, 1901.				* Average for previous Years.					
					Mean Max.	Mean Min.	Mean of Month.	Highest of Max.	Lowest Min.	Mean Max.		Mean Min.	Highest ever recorded.	Lowest ever recorded.
SOUTH-WEST AND SOUTH COAST.														
Perth Gardens	30-102	30-058	30-469	29-725	73-7	53-8	63-8	86-5	46-2	72-7	52-2	97-0	38-0	164
Perth Observatory	30-105	30-012	30-483	29-748	70-8	54-1	62-4	84-7	45-5	68-3	53-3	86-6	42-2	166
Fremantle	30-092	30-086	30-433	29-650	68-0	56-0	62-0	83-0	47-0	68-6	53-9	96-0	40-0	134
Rottnest	30-094	30-034	30-466	29-757	67-7	56-9	62-3	80-2	48-0	69-3	52-2	88-5	40-0	109
Mandurah	...	...	...	...	70-9	49-4	60-2	83-3	38-0	...	...	...	...	131
Wandering Collie	...	...	...	...	71-8	44-1	58-0	85-1	33-6	...	...	...	...	60
Dardanup	...	...	...	...	...	...	...	...	...	...	...	...	...	66
Bunbury	30-110	30-043	30-468	29-726	70-2	50-1	60-2	87-0	38-8	67-1	50-1	89-2	34-0	107
Busseton	...	...	...	...	69-6	49-7	59-6	82-0	39-0	...	...	...	...	2871
Bridgetown	...	...	...	...	72-0	44-1	58-0	85-0	32-0	...	...	...	...	3132
Karridale	30-098	29-967	30-429	29-665	67-3	51-9	59-6	86-2	37-0	65-8	50-3	84-2	37-0	2784
Cape Leeuwin	30-077	29-921	30-138	29-458	65-0	55-7	60-4	82-8	49-0	64-3	54-7	75-3	45-4	2734
Katanning	30-106	29-952	30-402	29-724	71-6	46-0	58-8	87-0	33-5	69-7	45-2	92-0	31-0	4251
Albany	30-096	30-022	30-425	29-692	66-6	50-0	58-3	83-5	39-2	63-4	50-6	88-0	38-0	3217
Breaksea	30-078	...	30-418	29-610	63-2	53-1	58-2	78-0	42-8	62-4	51-7	75-0	39-0	1541
Esperance	30-074	30-016	30-295	29-648	70-4	53-3	61-8	101-4	42-0	68-9	50-6	110-0	36-2	2860
Balladonia	30-082	...	30-317	29-646	76-3	47-6	62-0	98-4	38-0	...	...	...	...	1871
Eyre	30-054	...	30-341	29-424	70-8	50-6	60-7	96-7	30-0	...	...	...	...	2340
...	...	...	...	...	...	...	...	...	...	...	...	...	...	697
...	...	...	...	...	...	...	...	...	...	...	...	...	...	1133

* The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

The Observatory,

6th November.

W. E. COOKE,
Government Astronomer.

RAINFALL for September, 1901 (completed as far as possible), and
for October, 1901 (principally from Telegraphic Reports).

STATIONS.	SEPTEMBER.		OCTOBER.		STATIONS.	SEPTEMBER.		OCTOBER.	
	No. of points. 100 = in.	No. of wet days.	No. of points. 100 = in.	No. of wet days.		No. of points. 100 = in.	No. of wet days.	No. of points. 100 = in.	No. of wet days.
EAST KIMBERLEY:					NORTH-WEST—cont.				
Wyndham ...	4	1	Nil	...	Corunna Downs...	Nil	...	...	...
6-Mile ...	22	1	30	1	Nullagine ...	Nil	...	Nil	...
Carlton ...	...	...	...	...	Yandicoogina ...	Nil	...	...	...
Denham ...	...	...	...	...	Tambourah ...	Nil	...	Nil	...
Newry ...	...	...	...	...	Kerkiadary ...	...	...	...	...
Rosewood Downs	140	1	...	...	Roy Hill ...	Nil	...	...	...
Argyle Downs ...	...	...	...	...	Mosquito Creek	...	...	...	...
Lisadell ...	...	...	...	...	Mulga Downs ...	Nil	...	...	...
Turkey Creek ...	26	1	Nil	...	Woodstock ...	...	...	...	...
Plympton, St. M.	...	...	...	...	Mt. Florence ...	...	...	...	...
Koojubrin ...	...	...	...	...	Tambrey ...	Nil	...	...	...
Hall's Creek ...	Nil	...	Nil	...	Millstream ...	...	...	...	...
Flora Valley ...	...	...	...	...	Hong Kong ...	...	...	...	...
Ruby Creek ...	...	...	...	...	Mallina ...	...	...	...	...
Denizen Downs...	Nil	...	...	...	Whim Creek ...	Nil	...	Nil	...
WEST KIMBERLEY:					Cooyapooya ...	Nil	...	...	...
Obagama ...	...	...	...	...	Woodbroke ...	...	...	...	...
Derby ...	Nil	...	Nil	...	Croydon ..	Nil	...	...	...
Yeeda ...	...	...	...	...	Balla Balla ...	Nil	...	Nil	...
Liveringa ...	...	...	...	...	Roebourne ...	Nil	...	Nil	...
Mt. Anderson ...	...	...	...	...	Cossack ...	Nil	...	Nil	...
Leopold Downs...	Nil	...	...	...	Fortescue ...	Nil	...	Nil	...
Fitzroy Crossing	65	1	Nil	...	Mardie ...	Nil	...	...	...
Quanbun ...	...	...	...	...	Mt. Stewart ...	...	...	...	...
Nookanbah ...	...	...	...	...	Yarraloola ...	...	...	...	...
Broome ...	10	2	Nil	...	Chinginarra ...	Nil	...	...	...
Thangoo ...	...	...	...	...	Onslow ...	2	1	Nil	...
La Grange Bay...	13	2	Nil	...	Peedamullah ...	...	...	...	...
NORTH-WEST:					Red Hill ...	Nil	...	...	...
Wallal ...	Nil	...	Nil	...	Mt. Mortimer ...	...	...	...	...
Condon ...	5	1	Nil	...	Wogoola ...	...	...	...	...
De Grey River ...	Nil	...	...	...	Nanutarra ...	...	...	...	...
Port Hedland ...	Nil	...	Nil	...	Yanrey ...	...	...	...	...
Boodarie ...	Nil	...	...	...	Point Cloates ...	22	1	...	...
Yule River ...	...	...	...	...	GASCOYNE:				
Warralong ...	Nil	...	...	...	Winning Pool ...	Nil	...	Nil	...
Muccan ...	Nil	...	...	...	Towara ...	...	...	...	...
Ettrick ...	...	...	...	...	Ullawarra ...	...	...	...	...
Mulgie ...	...	...	...	...	Woorkadjia ...	...	...	...	...
Eel Creek ...	...	...	...	...	Thomas Police	...	...	...	...
Coongon ...	Nil	...	...	...	Station ...	...	...	...	...
Warrawagine ...	...	...	...	...	Bangemall ...	8	1	...	...
Bamboo Creek ...	Nil	...	Nil	...	Mt. Augustus ...	...	...	...	...
Marble Bar ...	Nil	...	Nil	...	Minnie Creek ...	3	1	...	...
Warrawoona ...	Nil	...	Nil	...	Yanyareddy ...	Nil	...	...	...
					Williambury ...	...	...	...	...

RAINFALL—continued.

STATIONS.	SEPTEMBER.		OCTOBER.		STATIONS.	SEPTEMBER.		OCTOBER.	
	No. of points. 100 = 1 in.	No. of wet days.	No. of points. 100 = 1 in.	No. of wet days.		No. of points. 100 = 1 in.	No. of wet days.	No. of points. 100 = 1 in.	No. of wet days.
GASCOYNE—contd.					GASCOYNE—contd.				
Wandagee ...	6	1	...	...	Warracoothara ...	...	...	...	...
Minilya ...	...	...	...	...	Challa ...	...	...	...	...
Boolathana ...	...	...	...	...	Youeragabbie ...	...	...	...	...
Carnarvon ...	15	1	24	...	Murru ...	...	...	...	...
Bernier Island ...	15	1	...	...	Yalgoo ...	5	1	4	1
Cooralya ...	...	...	...	...	Gabyon ...	...	...	...	...
Doorawarrah ...	...	...	...	...	Gullewa ...	16	2	5	1
Mungarra ...	3	1	...	...			
Clifton Downs ...	...	...	...	...	SOUTH-WEST DIVI-				
Dairy Creek ...	26	1	...	...	SION (NORTHERN				
Errivilla ...	Nil	...	...	...	PART):				
Dirk Hartog Island	34	2	...	...	Murchison House	33	4	...	...
Sharks Bay ...	10	1	Nil	...	Mt. View ...	22	4	...	...
Kararang ...	41	3	...	...	Yuin ...	...	...	...	...
Meedo ...	26	1	...	...	Northampton ...	43	3	94	3
Tamala ...	...	...	...	...	Mt. Erin ...	74	6	58	4
Wooramel ...	16	2	4	1	Oakabella ...	...	...	...	...
Hamelin Pool ...	34	1	Nil	...	Narra Tarra ...	56	2	...	...
Byro ...	13	1	...	...	Tibbraden ...	129	5	40	4
Yarra Yarra ...	...	...	...	...	Sand Springs ...	...	...	43	4
Berringarra ...	10	1	...	...	Mullewa ...	23	5	20	1
Mt. Gould ...	...	...	...	...	Kockatea ...	...	...	20	2
Moorarie ...	...	...	...	...	Bootenal ...	...	...	...	...
Peak Hill ...	19	1	35	...	Geraldton ...	32	7	25	9
Horseshoe ...	3	1	22	1	Greenough ...	62	7	16	3
Abbott's ...	12	1	11	2	Dongara ...	50	3	62	4
Belele ...	...	...	...	...	Dongara (Pearse)	53	7	64	7
Mileura ...	9	1	...	...	Strawberry ...	41	2	...	...
Milly Milly ...	...	...	...	...	Mingenew ...	69	6	51	6
Manfred ...	5	1	...	...	Rothsay ...	8	1	...	...
Meelya ...	Nil	...	...	...	Field's Find ...	8	2	...	...
Woogorong ...	Nil	...	...	...	Carnamah ...	46	4	31	3
Boolardy ...	Nil	...	...	...	Watheroo ...	78	5	28	4
Billabalong ...	Nil	...	...	...	Dandaragan ...	160	7	70	4
Wooleane ...	Nil	...	...	...	Moora ...	94	2	40	4
Murgoo ...	Nil	...	...	...	Yatheroo ...	206	10	...	...
Meeka ...	Nil	...	...	...	Walebing ...	85	10	80	7
Mt. Wittenoom ...	Nil	...	...	...	New Norcia ...	96	7	54	8
Nannine ...	Nil	...	1	1					
Star of the East ...	Nil	...	5	1	SOUTH-WESTERN				
Annean ...	...	...	...	...	DIVISION CENTRAL				
Tuckanarra ...	8	2	Nil	...	(COASTAL):				
Coodardy ...	...	...	...	...	Gingin ...	267	13	161	8
Cue ...	Nil	...	2	1	Belvoir ...	220	14	...	...
Day Dawn ...	Nil	...	Nil	...	Mundaring ...	341	13	...	...
Lake Austin ...	5	2	Nil	...	Guildford ...	191	12	224	9
Lennonville ...	10	1	23	1	Kalbyamba ...	208	15	120	10
Mt. Magnet ...	11	1	41	1	Canning W't'r w'ks	332	13	...	...

RAINFALL—continued.

STATIONS.	SEPTEMBER.		OCTOBER.		STATIONS.	SEPTEMBER.		OCTOBER.	
	No. of points 100 = lin.	No. of wet days.	No. of points. 100 = lin.	No. of wet days.		No. of points 100 = lin.	No. of wet days.	No. of points. 100 = lin.	No. of wet days.
SOUTH-WEST— <i>contd.</i>					SOUTH-WEST— <i>contd.</i>				
Perth Gardens ...	263	15	164	12	Salvation Army Settlement	267	17	63	8
Perth Observatory	275	16	166	12	Glen Mervyn ...	309	14	...	...
Subiaco ...	225	16	177	10	Dardanup ...	258	14	107	10
Claremont ...	260	16	...	...	Donnybrook ...	306	18	111	6
Claremont (Richardson) :	219	11	186	8	Boyanup ...	281	17	100	10
Fremantle ...	195	19	134	...	Busselton ...	110	19	105	14
Rottnest ...	147	18	109	...	Quindalup ...	214	17	132	10
Armadale ...	193	13	...	...	Margaret River	270	11	297	10
Rockingham ...	249	17	138	8	Lower Blackwood	402	20	...	...
Canning River ...	390	16	189	11	Kurridale ...	259	23	179	15
Jarrahdale ...	431	15	165	9	Augusta ...	197	13	121	8
Mandurah ...	283	15	131	9	Cape Leeuwin ...	155	26	140	18
Pinjarrah ...	324	14	169	9	Biddellia ...	294	20	...	...
Harvey ...	377	17	...	...	The Warren ...	446	19	293	11
SOUTH-WEST, CENTRAL PART (INLAND) :					Lake Muir ...	266	20	183	13
Goomalling ...	...	...	...	...	Mordalup ...	194	20	...	...
Momberkine ...	69	7	...	...	Deeside ...	262	18	204	12
Culham ...	64	7	91	8	Riverside ...	216	19	204	10
Newcastle ...	87	5	56	5	Balbarup ...	206	15	185	12
Eumalga ...	132	10	91	6	Wilgarup ...	231	20	...	...
Northam ...	45	7	40	4	Mandalup ...	288	16	139	7
Grass Valley ...	63	7	...	...	Bridgetown ...	212	21	124	12
Meckering ...	41	5	...	...	Greenbushes ...	281	16	169	12
Cunderdin ...	26	3	18	2	Williams ...	67	9	57	6
Doongin ...	38	3	...	...	Arthur ...	110	11	89	8
Whitehaven ...	61	9	...	...	Darkan ...	120	12	52	6
Sunset Hills ...	65	5	52	3	Wagin ...	106	11	59	6
Cobham ...	64	11	55	5	Glencove ...	108	11	55	6
York ...	54	7	33	3	Dyliabing ...	99	8	84	8
Beverley ...	42	4	41	4	Katanning ...	99	2	99	10
Barrington ...	54	7	23	5	Kojonup ...	110	10	114	6
Sunning Hill ...	64	6	50	3	Broomehill ...	130	10	68	7
Wandering ...	138	13	60	6	Sunnyside ...	109	11	...	...
Pingelly ...	37	7	32	4	Woodyarrup ...	76	13	78	7
Marradong ...	209	11	70	5	Cranbrook ...	123	12	108	8
Bannister ...	159	13	55	7	Blackwattle ...	167	7	...	...
Narrogin ...	81	10	35	4	Mt. Barker ...	198	13	282	12
Wickepin ...	50	7	36	5	Kendenup ...	225	15	139	10
SOUTH-WEST DIVISION (SOUTHERN PART) :					St. Werburgh's	196	18	...	...
Bunbury ...	283	19	91	9	Forest Hill ...	258	23	...	...
Collie ...	265	18	66	9	Denmark ...	347	16	...	...
					Albany ...	323	20	238	14
					Point King ...	358	21	240	12
					Breaksea ...	187	18	160	10
					Wattle Hill ...	...	...	...	...
					Cape Riche ...	...	...	...	...
					Pallinup ...	76	13	63	9

RAINFALL--continued.

STATIONS.	SEPTEMBER.		OCTOBER.		STATIONS.	SEPTEMBER.		OCTOBER.	
	No. of points. 100 = 1 in.	No. of wet days.	No. of points. 100 = 1 in.	No. of wet days.		No. of points. 100 = 1 in.	No. of wet days.	No. of points. 100 = 1 in.	No. of wet days.
SOUTH-WEST-- <i>contd.</i>					EASTERN-- <i>contd.</i>				
Bremer Bay ...	140	9	254	11	50-Mile Tank ...	102	2	35	1
Jarraamongup ...	199	15	...	...	Norseman ...	111	5	39	4
EASTERN DIVISION:					Bulla Bulling ...	79	...	27	...
Lake Way ...	...	...	42	1	Woolgangie ...	58	4	53	1
Mt. Sir Samuel ...	<i>Nil</i>	...	8	2	Boorabbin ...	72	5	26	3
Lawlers ...	6	1	11	2	Karalee ...	44	4	7	1
Lake Durlôt ...	<i>Nil</i>	...	...	...	Yellowdine ...	60	...	...	...
Diorite King ...	15	1	...	...	Southern Cross... ..	49	4	7	2
Sturt Meadows... ..	...	...	...	...	Mt. Jackson ...	45	3	37	1
Mt. Leonora ...	10	1	9	1	Bodallin ...	15	4	15	3
Mt. Malcolm ...	30	1	<i>Nil</i>	...	Burncoppin ...	43	2	13	2
Mt. Morgan ...	55	3	19	1	Kellerberrin ...	36	5	12	1
Laverton ...	71	2	27	2	Mangowine ...	60	2	...	...
Murrin Murrin... ..	28	2	6	1	Waltoning ...	42	3	26	1
The Granites ...	45	2	13	1	EUCLA DIVISION:				
Tampa ...	2	1	2	1	Ravensthorpe ...	139	5	146	11
Niagara ...	59	2	10	...	Coonarup ...	130	10	151	10
Yerilla ...	56	2	19	2	Hopetoun ...	227	13	199	16
Edjudina ...	...	...	...	...	Fanny's Cove ...	257	13	...	...
Menzies ...	35	2	16	1	Park Farm ...	263	14	...	...
Mulline ...	...	...	32	1	Esperance ...	233	16	208	...
Waverley ...	55	3	35	1	Gibson's Soak ...	174	10	...	...
Goongarrie ...	59	2	31	1	30-Mile Condenser	...	...	...	...
Mulwarrie ...	30	3	40	1	Swan Lagoon ...	239	15	...	...
Kurawa ...	94	3	48	1	Grass Patch ...	149	11	...	...
Dixie Gold Mine	109	3	...	...	Myrup ...	...	...	186	13
Kurnalpi ...	151	3	33	3	Lynburn ...	158	8	...	...
Bulong ...	156	4	65	3	Boyatup ...	158	8	...	...
Kanowna ...	97	5	63	2	Middle Island ...	...	...	161	12
Kalgoorlie ...	120	6	49	1	Point Malcolm ...	206	8	114	9
Coolgardie ...	93	4	19	1	Israelite Bay ...	203	6	113	5
Burbanks P.O. ...	73	...	14	1	Frazer Range ...	131	4	...	...
Burbanks Birth- day Gift ...	74	3	15	1	Balladonia ...	181	...	63	...
Woolubar ...	126	4	30	1	Eyre ...	322	11	114	...
Widgemooltha ...	141	6	42	2	Eucla ...	175	6	110	7

The Observatory, Perth,
10th November, 1901.

W. E. COOKE,
Government Astronomer.

Return of Fruit imported into Western Australia during October, 1901.

NAME OF PORT.	No. of Ships.	No. of Consignments Inspected.	Total No. of Cases.	No. of Cases Passed.	No. of Cases Prohibited.	No. of Cases Destroyed.	No. of Cases in Quarantine.	No. of Cases Dipped.	No. of Cases of																
									Apples.	Apricots.	Bananas.	Cherries.	Gooseberries.	Lemons.	Nectarines.	Oranges.	Passion Fruit.	Pears.	Plums.	Rhubarb.	Strawberries.	Pomatoes.	Pines.	All other fruits.	
FREMANTLE	16	66	8012	6813	1199	1199	..	8012	1277	..	1303	..	..	1082	..	3022	110	..	..	..	..	19	..	..	4
ALBANY	6	8	282	281	21	21	..	282	54	..	15	..	..	26	..	151	10	..	..	..	1	..	..	..	..
GERALDTON	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
HAMELIN	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
BUSSELLTON	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
BUNBURY	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
ESPERANCE	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
TOTAL	22	74	8204	7674	1220	1220	..	8204	1331	..	1318	..	..	1108	..	3173	120	..	..	1	..	19	..	..	4

Department of Agriculture,

7th November, 1901.



JOURNAL

OF THE

DEPARTMENT OF AGRICULTURE

OF

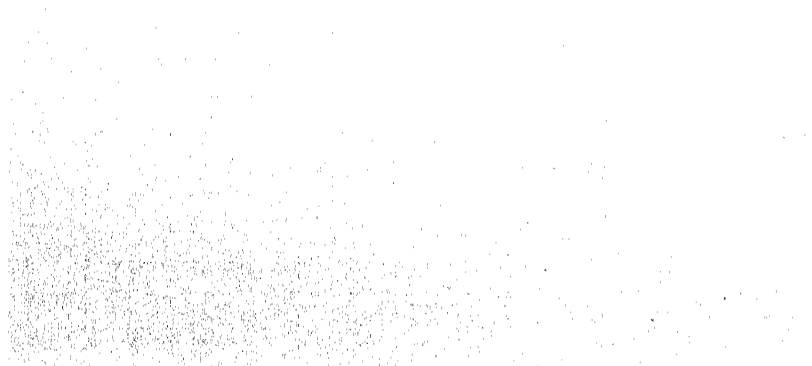
WESTERN AUSTRALIA.

Vol. 4.—Part 6.

DECEMBER, 1901.

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1901.



NOTES.

ORANGES FOR LONDON AS ORDINARY CARGO.—Mr. Charles Pitt, of Payneham, has kindly shown us (says the *Garden and Field*) account sales of several small shipments of oranges, packed in ordinary cases, and sent by the Lund's Line of steamers as ordinary cargo. The expenses on 50 cases were:—Cases, wrapping, and cartage, 1s. 3d. a case; freight, wharfages, insurance, and other Adelaide charges, 2s. 7½d.; and London charges, 1s. 2½d.; or a total of 5s. 1d. per case. The fruit arrived in splendid condition at the beginning of September, and was sold by Messrs. John Osborne & Co., of Covent Garden Market, London, at a price which netted 3s. a case above the price the same fruit would have realised in Adelaide. We gather from the advices that the market was limited at the prices obtained. They were shipped through Messrs. Geo. Wills & Co., of Grenfell street.

POINTS OF A DRAUGHT HORSE.—Have the head of a fair size. Do not buy a horse with a pony head. A wide forehead is a good indication in a colt, the poll being not so wide, as the ears tend to droop, such horse often being stubborn in disposition. The eye should be prominent and the throatlatch clean, with a well-muscled neck. The shoulders should be somewhat sloping. Upright shoulders tend to make the gait stilted.

WHITEWASH.—This is one of the best disinfectants we have. Apply it to the walls of the cellar and to various outbuildings around the premises. The whitewash here described is especially desirable for outdoor work. Take half a bushel of nice, unslaked lime. Slake it with boiling water, covering it during the process to keep in the steam. Strain the liquid through a fine sieve or strainer, and add to it a peck of salt previously dissolved in warm water, 3lb. of ground rice boiled to a thin paste, ½lb. of clean glue which has been previously dissolved by soaking it well in warm water and then putting it over the fire in a double glue-pot. Add five gallons of hot water to the mixture given. Stir it well, and let it stand covered for a few days. It should be applied hot, and for this purpose it can be kept on a portable furnace. One pint of this mixture will cover a square yard of surface.

TUBERCULOSIS IN SHEEP.—Professor M'Fadyean has recently recorded the first authenticated case of tuberculosis which has been seen in England in the sheep. The specimen consisted of part of the side of a sheep seized in a London slaughter-house. On the inside of the chest-wall and upper surface of the sternum there were clusters of nodules very like the "grapes" so frequently found in tuberculosis of cattle. These contained caseating and partially calcified contents. Professor M'Fadyean draws attention to the

fact that, although this is the first case which has been recorded as occurring in England, tuberculosis of the sheep is met with to a certain extent in the German slaughter-houses.

NUMBER OF SHEEP IN THE WORLD.--According to a contributor in the *Pastoralists' Review*, from general inquiries made, the approximate numbers of sheep throughout the world number as follows :—

Australasia	...	...	92,000,000
Europe	...	...	165,000,000
Asia	...	...	53,000,000
Africa	...	...	13,500,000
United States...	...	...	42,000,000
Canada	...	...	4,500,000
Argentina	...	...	80,000,000
Other South American States	...	...	40,000,000
Total	...	...	490,000,000

Of the 42,000,000 sheep in the United States, the *Cincinnati Price Current* says 21,000,000, or 50 per cent. of the whole, are raised in the five States of Idaho, Wyoming, Utah, and Colorado, and the territory of New Mexico. This is nearly three times as many as are produced in the five great States of the central west, Ohio, Indiana, Illinois, Michigan, and Wisconsin, which were the stronghold of sheep and wool growing until recent times.

CLEANING THE PLOUGH.—A good plan for cleaning the plough, which will also work well on other tools of iron or steel, is as follows :—Slowly add one pint of sulphuric acid to one quart of water, handling it carefully and stirring slowly, as considerable heat will result from the mixing. When it is cool moisten the surface of the metal with this, and then rub dry, after which wash off with pure water. This application should clean any surface not too badly rusted, but if the tool has been long neglected it may require more than one application. After cleaning, a thorough coating of grease is given before putting a tool away, and when taken out to use give another greasing, and it will go one horse easier. It is much easier not only for team, but for ploughman also.

VALUE OF WOOD ASHES.—The three valuable fertilising elements found in wood ashes are potash, phosphoric acid, and lime. The value of a sample of wood ashes was formerly measured by the amount of potash it contained, but now that the value of lime is more generally recognised, that element is considered. The value of any sample of ash will depend on the wood which was burned to produce it, and on the way it was burned. If exposed to the weather heavy rains will leach out some of the potash. It is

probably safe to assume that the average ton of wood ashes kept under cover contains 5 per cent. of potash, $1\frac{1}{2}$ per cent. of phosphoric acid, and 33 per cent. of lime. The phosphoric acid in ashes is insoluble, but the potash and the lime are both in good form for plant feeding. Wood ashes have a mechanical effect on soils. They bind the lighter sandy loams more closely together, thus making them better able to hold water. The lime acts beneficially on clay soils by pulverising them. The potash lye from the ashes, in solution, has power to dissolve organic matter, and thus making nitrogen in the soil available. Wherever wood is burned on the land very rank growth is sure to follow. This is not all due to the potash left in the ashes from the burning, but because that potash helped to make the nitrogen in the soil available for plant food.

PARASITE OF THE CODLIN MOTH.—The credit of discovering the natural enemy of the codlin moth in New Zealand belongs to Mr. Boucher, one of the fruit experts attached to the division of biology and horticulture of the New Zealand Department of Agriculture. Mr. T. W. Fink, biologist of the department, in an interesting letter to Mr. J. Donaldson, secretary of the Australian Widows' Fund in Melbourne, describes how the discovery was made of this tiny parasite of the eggs of the dreaded moth—a small fly—specimens of which were sent to Professor Howard, of the United States Department of Agriculture, who at once identified them as one of the parasites known in America, and discovered several years ago by Prof. Slingerland. "Till further investigated," the letter continues, "no general opinion either for or against would be warranted, and I cannot refrain from urging my oft-repeated warning, viz., not to rely too implicitly on natural enemies, for it must be remembered that many species of which much was expected have proved very disappointing." Mr. Boucher will watch the insect next season, and the New Zealand department will then be in a better position to express an opinion. If it proves a success steps will be taken to collect parasitised eggs of the codlin moth and send them to other localities, that is, if they are found not to possess it already. Mr. Fink suggests that careful search be made in the orchards of Victoria.—*Melbourne Argus*.

WORKING MARES IN FOAL.—It is not necessary to relieve breeding mares from work on the farm while they are in foal. Light, regular work on the farm or on good roads will do them good, and can be continued until quite close to foaling time. Ploughing light land will not be too severe, and harrowing is also suitable employment. The food for mares is a very important matter. Good wheaten hay, with a little oats and bran, is an excellent diet. Enough feed should be given to keep the mare in good firm condition. If these directions are carried out, the coming foal will be given an excellent chance of having a good start in life.—"KERNEL," in *The Garden and Field*.

THE INSECTIVOROUS BIRDS OF WESTERN AUSTRALIA.

BY ROBERT HALL.

BABBLER, BELL-BIRD, AND TITMOUSE.

One seldom meets with any of the above three species in a well-watered district, but they may often enough all be met together in a dry and streamless area.

So much are they alike in respect to character of country in which they associate, that a field man early learns to think of them in union. The Babbler, better known in parts as the Cat-bird or Chatterer, is particularly noisy. The Titmouse is as active with its legs as the other is with its tongue. The Bell-bird is celebrated for its liquid call, though it is not so definite as that of the Bell-minah of South-East Australia. These are the only two bell calls among the fauna of our continent. It may be thought that the Titmouse should have been associated with the tits, but the structural differences are so great that there is no special reason for speaking of them together. They certainly are a lively, interesting lot. It is characteristic of certain birds to be gregarious. The Babbler and Titmouse are so. In this disposition there are ways employed that vary greatly from one another, such as those of the Crow, Martin, and Quail.

WHITE-BROWED BABBLER (Chatterer, Cat-bird.)

Pomatorhinus Superciliosus, V. & H.; (*Po-ma-to-rin-us su-per-sil-i-ō'sus*).

Poma, a lid; *rhinus*, nostril; *super*, over; *cilium*, eyelid.

Pomatorhinus superciliosus, Gould, "Birds of Australia," fol., vol. iv., pl. 22;
"Key to Birds of Australia," Hall, p. 29 (1899).

GEOGRAPHICAL DISTRIBUTION.—AREAS 9, 7, 6, 4, 3, 2, 1.

KEY TO THE SPECIES.—Distinct white eyebrow; lower breast whitish, without any rufous; forehead and crown brown; culmen long, and longer than tarsus; wings rounded, 3.5 inches.

It is worthy of note that while the present species is found in all except the North-West of the continent, there is a second species that is located in this area and not in any other part of our State. It differs in having the breast a bright rufous, and for that reason is recognised as the Red-breasted Babbler. (*P. rubeculus*, Gld.)

The manner of life of the Babblers differs from most birds yet agrees with that of the Grey Jumper (*Struthidea*) or Chough (*Corcorax*), birds that will some day, I believe, be recorded as inhabiting the Eastern part of the State. All are noisy. Each associates in a number from 6 to 10. The three genera, very

dissimilar in form, are ground-loving birds, even though they are correctly termed "Passeres" or "Perchers" because of their structure. The power of flight of the Babblers is very limited, and its great use is to convey the birds from the top of one sapling to the bottom of another. The company talks a great deal, hops over the ground energetically, and when disturbed jumps from bough to bough until each has got well up the young tree. They never seem to rest a minute. With the wing and tail well spread, and carried much above the plane of the back, a group presents a strange sight, and one quite peculiar to the genus. When disturbed, the notes of the birds become very much confused in a harsh jumble. The comparison with the mew of a cat is not nearly so good as with that of the Cat-bird (*Aeluroedus*) of New South Wales. The nesting habits of the genus are comparatively strange. About half-a-dozen nests are built before eggs are laid in the final one. It is a very great advantage to the birds in adopting this means, perhaps unconsciously, for the preservation of their eggs.

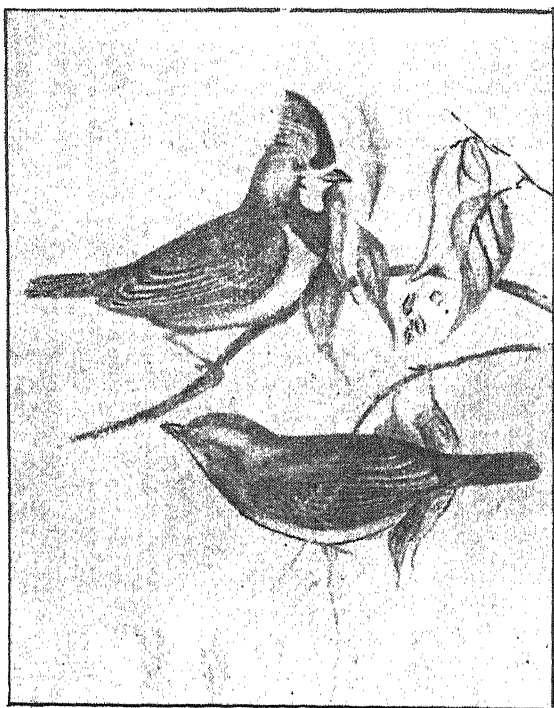
The flock assist one another in building, and three to five eggs are laid by each pair. Occasionally as many as 10 eggs will be found in the one nest, as if to indicate that two families were occupying the same house.



WHITE-BROWED BABBLER (Chatterer, Cat-Bird.)

Nest.—Rugged in appearance, large and spherical, with side entrance spouted, made of twigs and lined with grasses, etc., situated in a small tree.

Eggs.—Four, generally, to a sitting; pale brown, with peculiar cobweb or hair-like irregularly placed upon them. Length, 1 inch; breadth 0·35 inch.



CRESTED BELL BIRD (Crested oreoica).

Oreica cristata, Lewin (O-re-o'i'ka kris-ta'ta).

Oros, a mountain; *oikos*, dwelling; *crista*, a crest (*cristata*, tufted).

Oreica gutturalis, Gould, "Birds of Australia," fol. ii., pl. 81;

"Key to the Birds of Australia," Hall, p. 32 (1899).

GEOGRAPHICAL DISTRIBUTION, 9, 8, 7, 6, 3, 2, 1.

KEY TO THE SPECIES—

Male.—Crest, deep brownish black; upper surface, reddish brown; forehead and lores, white; black stripe extends over cheeks and unites with black of lower throat; chin and upper parts of throat, white; upper part of breast, deep brownish black; lower breast and abdomen, white. Total length, 8·5 inches.

Female.—Lighter in colour; lower throat and upper breast nearly uniform reddish brown.

This Bell bird is the only species of the genus, and it is confined to our continent. The actions are spirited, a series of hops, and when disturbed a flight is made towards the nearest tree. The bulk of its food is found near or upon the ground; and insects,

their larvæ, and seeds form the diet. In many respects it is like the Collyriocinclæ (thrushes) that frequent the drier regions. It stays in the same district during the winter as in summer, and in September or October, in the South, sets about the preparations for rearing a first brood. Mr. Gilbert, the able coadjutor of Gould, describes accurately the vocal powers of the species. "The most singular feature," says Gilbert, "connected with this bird is that it is a perfect ventriloquist. At first its note commences in so low a tone that it sounds as if at a considerable distance, and then gradually increases in volume till it appears over the head of the wondering hearer, the bird that utters it being all the while on the dead part of a tree perhaps not more than a few yards distant, its motionless attitude rendering its discovery very difficult. It has two kinds of song, the most usual of which is a running succession of notes, or two notes repeated together rather slowly, followed by a repetition, three times, rather quickly, the last note resembling the sound of a bell from its ringing tone. The other song is nearly the same, only that it concludes with a sudden and peculiar fall of two notes." The meaning of the generic name does not well apply to the habitat of the bird, unless considered as a species of our mountains, or rather hills, surrounded by extensive plains. For example, the Macdonnell Ranges in Central Australia, where the bird is quite at home, would apply to the case if the bird was not also quite numerous in wooded, dry areas, and absent or rare in mountains proper.

Nest.—Cup-shaped and deep; made of bark and lined with fibres, etc.; placed in the vicinity of the ground.

Eggs.—Two, or rarely three, to a clutch. They vary considerably, and may have the ground a very pale bluish white, or white; the dots dispersed upon them may be black, or peculiar blotches and crescents, closely or broadly separated. Length 1 inch, breadth 0·8 inch.

WHITE-FACED TITMOUSE.

Xerophila leucopsis Gld. (*Ze-ro-fil'a lu-kop'sis*).

Zeros, dry; *philsin*, to love; *leukos*, white; *ops* (*opsis*), face.

Xerophila leucopsis, Gould, "Birds of Australia," fol., vol. iii., pl. 67;

"Key to the Birds of Australia," Hall, p. 80 (1899).

GEOGRAPHICAL DISTRIBUTION.—Areas 9, 7, 6, occasionally 2 and 4.

KEY TO THE SPECIES.—Under surface white, upper surface brown; forehead white; tail square; first primary larger than half second; bill higher than broad; nostrils in a semi-operculated groove, round, and partly hidden by feathers—total length, four inches.

It is one of three species, and a cheerful little bird; delighted to build under the verandah of the house, and to act as a scavenger about the property. Although omnivorous to a degree, it is insectivorous. It is just such a bird whose presence about a farm is worth cultivating, for it allows no waste, and indirectly helps to prevent germ growth. It is unfortunate that the introduced Sparrow (*Passer domesticus*) does not confine itself to this exact

occupation in the country, which it well performs in a town. In most respects the White-face is a tit; but the bill, which is more like that of a grain-eater than that of a tit, separates them. It associates in small flocks of a dozen, more or less, and, upon the ground, pries into whatever is likely to afford a meal. As the name implies, it is a lover of dry-districts. With regard to its nesting, it is not particular where it builds. I once saw a nest in the rolled-up side flap of a wagonette. The birds possibly thinking it was of no use to the owners, built a nest in a part of it. During the period of incubation the sitting bird made two journeys of 24 miles each, and the mate received it very kindly on return. Unfortunately, the flap was lowered by a stranger and the eggs were broken.

In disposition it is so remarkably tame that it will allow of a very near approach before it will rise; then it merely flies to the nearest bush or low tree. A second species is said to inhabit the country about Esperance Bay, having a pectoral band of cinnamon.

Nest.—Loosely constructed, oblong and open, made of grasses, and lined with feathers, etc. It may be placed in bushes, or such places as under the eaves of verandahs.

Eggs.—Five to the clutch; much freckled with reddish-brown on a faint white ground. Length, 0·8in.; breadth, 0·6in.

WEDGE-BILL, DOLLAR-BIRD, AND WHIP-BIRD.

To furnish observations upon the above three species is like supplying notes on feathered curiosities. The Whip-bird lives only in the dense scrub. The Dollar-bird travels nearly if not all round the Continent. The peculiarly formed Wedge-bill perches on bush tops, and calls in the sweetest possible manner, slipping out of sight at the first note of danger. The first and last are said to be closely allied, and particularly shy, while all have surprisingly strange eggs. The Wedge-bill is represented by one known species, and the Whip-bird by two, of which one is found on the Western side of the Continent and the second on the Eastern. The Dollar-bird of the colonists is known by one species only in Australia, though by several in Asia and Africa.

WEDGE-BILL (Kittylintof, Crested Wedge-bill).

Sphenostoma cristatum, Gld. (*Sfe-nos'to-mii cris-ta'tum*.)

Sphen, a wedge; *stoma*, mouth; *crista*, a crest.

Sphenostoma cristatum, Gould, "Birds of Australia," fol., vol. iii., pl. 17;

"Key to the Birds of Australia," Hall, p. 31 (1899).

GEOGRAPHICAL DISTRIBUTION.—Areas 9, 7, 6, 1.

KEY TO THE SPECIES.—Long crest to feathers of occiput; general colour above, uniform earthy brown; under part dingy white, washed with greyish brown; outer tail feathers dark brown. Total length, 6·5 inches; wing, 3·3 inches; bill, 0·5 inch.

In writing of this species, the celebrated ornithologist, John Gould, asks us to observe more of its habits. Mr. Gould says—
"The Crested Wedge-bill is an inhabitant of the low scrubby trees

and polygonum bushes which stud the hot plains of the interior of Australia. . . . Whether it has any kind of loud, sharp whistle analogous to that of the Whip-bird (*Psophodes*), or if it has the same shy disposition, it would be interesting to ascertain; and to these points, as well as to all other details connected with its history, I would call the attention of those who may visit the interior or may otherwise be favourably situated for observing them. The sombre tints of the bird are very like the colour of the earth of the plains it inhabits; and when the nature of its food shall have been ascertained, its wedge-shaped bill will doubtless be found admirably adapted for procuring it."

It remains for us to refer to a portion of these remarks now, and settle others as opportunities occur. Certainly the voices of the two species are quite different. The Whip-bird has a powerful whip note, with a long drawn-out one prior to, and another short one subsequent to, the "whip," while the Wedge-bill has a sweet and soft series of notes, sounding like "kit-e-lin-tof." Both species are shy, but in most other respects their economy is at variance. We are not acquainted with the cradle history of either. Certain it is that the colouration and size of the eggs vary considerably in a number of the two species. I have found it nesting at Geraldton, and know it to be at Cue.

Nest.—Cup-shaped and large, made of twigs and lined with grass.

Eggs.—Two to a sitting. Light greenish blue varying in intensity in different clutches; purplish black spots which are drawn out in some specimens. Length, 0·8in.; breadth, 0·6in.

ROLLER (Dollar-bird).

Eurystomus Australis, Swains (*U-ris'to-mus as-tra-lis*).

Eurus, wide; *stoma*, mouth; *australis*, southern.

Eurystomus Australis, Gould, "Birds of Australia," fol., vol. ii., pl. 17; "Key to the Birds of Australia," Hall, p. 56 (1899.)

GEOGRAPHICAL DISTRIBUTION.—Areas 8, 6, 4, 3, 2.

KEY TO THE SPECIES.—General appearance green; bill, legs, and feet red; head and neck dark brown; bill as broad at gape as it is long; culmen rounded. Total length, 10·5in.; bill, 1in.; wing, 7·75in.

Over what extent of our State the present species roams is not yet known, because of their scarcity at any time. It appears to be numerous in November about the Richmond River, in New South Wales. Skins have been procured on the Fitzroy River, near Derby. Mr. Gould, in his "Handbook to the Birds of Australia," writes:—"It arrives early in spring, and, after having reared a family, retires northward on the approach of winter. It appeared to be most active about sunrise and sunset. In sultry weather it was generally perched upon some dead branch in a state

of quietude. It is a very bold bird at all times, but particularly so during the breeding season, when it attacks with the utmost fury any intruder that may venture to approach the hole in the tree in which it has its eggs. When intent upon the capture of insects, it usually perches upon the dead upright branch of a tree growing beside and overhanging water, where it sits very erect till a passer attracts its notice, when it suddenly darts off, secures its victim, and returns to the same branch. At other times it may constantly be seen on the wing, mostly in pairs, flying just above the tops of the trees, diving and rising again with many rapid turns. During flight, the silvery white spot in the centre of the wing shows very distinctly, and hence the name of Dollar-bird bestowed upon it by the colonists. It is a very noisy bird, particularly in dull weather, when it often emits its peculiar chattering note during flight."

Nest.—In the hollow of a tree, with decayed wood as a floor.

Eggs.—Two or three in number, white, rather glossy, and sometimes variable in form, some being oval and pointed, others being round (A. J. North). Length, 1.45 inches; breadth, 1 inch.

BLACK-THROATED WHIP-BIRD (Coach Whip-bird).

Psophodes nigrogularis, Gld. (*So-fol'des nig-ri-gu-la'ris*).

Psophos, an inarticulate noise; *niger*, black; *gularis*, pertaining to the throat.

Psophodes nigrogularis, Gould, "Birds of Australia," fol. vol. iii., pl. 16; "Key to the Birds of Australia," Hall, p. 29 (1899).

GEOGRAPHICAL DISTRIBUTION—Area 9.

KEY TO THE SPECIES.—General appearance olive-black; head, crested; throat, black with a white mark backwards from the lower mandible; tail has four outer feathers tipped with white, and banded with black above the white. Total length, 6 inches; tail, 4.5 inches.

Unfortunately very few of us are well acquainted with the Western Whip-bird. It must be a very interesting species. According to information gathered, it lacks the peculiar call of the Eastern form, which appears to support a law of representation so often referred to by Gould.

In respect to shy habits they agree, and one must need be very patient and enterprising to see it in the native haunt. The late Mr. Gilbert, who laboured so well in the interests of Western Australian ornithology, speaks of the species in the following way:—"It inhabits thickets of a small species of tea-tree (*Leptospermum*) growing among the sand hills, which run parallel with and adjacent to the beach. It utters a peculiar harsh and grating song which is quite impossible to describe, and which is so different from that of every other bird I ever met or am acquainted with that I shall have no difficulty in recognising it again wherever I may hear it. I heard it for the first time, together with the notes of many other birds equally strange to me, in the vicinity of the Wongan Hills, but could not then obtain a sight of the bird, although I knew

that it was only a few yards from me." It would be interesting to learn if the species has, in addition, a whip-like call.



BLACK-THROATED WHIP-BIRD (Coach Whip-Bird.)

Nest.—Open, loosely constructed; composed of twigs with leaves internally. It is placed near the ground in scrub and debris.

Eggs.—Two to a clutch; ground colour, pale greyish blue, marked upon the surface with peculiar formed spots and blotches of black. Length, 1in.; breadth, 0.75in.

PLAIN TALKS ON MANURES.

PERCY G. WICKEN.

In travelling around the country, the question which I think I am asked most is what manures to use for various crops; there appears to be a growing demand for information on this subject, which indicates that growers are anxious to improve their crops, and when the grower realizes that some improved method to that which he has been using is necessary, and begins to make inquiries as to what manures to use and how to apply them, then will the quantity and quality of the products raised in this State be greatly increased. Up to the present year the manure trade in Western Australia has been of very meagre dimensions, in fact it can hardly be said to have been worth considering, but this year (whether owing to the demand from settlers or the increased energies of the manure merchants, I am unable to say), the trade has very considerably increased. Bonedust, owing to the great demand in the Eastern States, has been scarce and the price high; other manures have been in fair request, and supplies quite sufficient to meet all demands.

FARMYARD MANURE.

Although this paper deals especially with the subject of artificial manures, it must not be supposed that I wish to detract in any way from the value of stable manure. Stable or farmyard manure is the best manure that can be used, but the supply is wholly inadequate to the demand. Most farmers make a larger or smaller quantity of stable manure, but only enough to manure a very small portion of the area of land which they cultivate, and are consequently forced to use artificial. Farmyard manure has both its advantages and disadvantages. Where a plentiful supply can be obtained and placed on the ground at a reasonable amount of expense, it is of great benefit, as apart from the value of its manurial ingredients it is of great mechanical benefit to the soil, and supplies a large quantity of humus, of which our soils in general are much in need. But its disadvantages are in the great bulk of substance that requires handling in comparison to the small amount of plant food supplied. The chemists tell us that the amount of plant food contained in one ton of well rotted and well preserved farmyard manure is—nitrogen, 8lbs.; phosphoric acid, 6lbs.; potash, 6lbs.; and this amount is contained in less than one cwt. of some of the artificial manures, that set down for onions for instance. It is worth, at the standard rates at which the following manures are based, about 10s., while one cwt. of the manure recommended for onions contains—nitrogen, 6lbs.; phosphoric acid, 9lbs.; and potash, 11lbs., at a cost of 9s. 6d. Farmyard manure, to contain even this small quantity of plant food, requires to be well preserved, while most of that made is exposed to the weather, the liquid allowed to leach away, and the manure is of very little value. The quality

of farmyard manure depends very largely also on the quality of the food supplied to the animals, and to a variety of other causes with which it is not proposed to deal in this article. The ingredients contained in farmyard manure are all those required in a complete manure, and farmyard manure should be saved and made into a compost for future use wherever it can be obtained.

ARTIFICIAL MANURES.

In the following notes I have endeavoured, in as plain terms as possible, to indicate, on broad lines, as to what manures should be used for various crops. I have purposely refrained from using any scientific terms. I often have occasion to tell a farmer to use a manure containing say 6 per cent. of potash or 10 per cent. of nitrogen, but I find that he is not much wiser for the information, as he does not know how to obtain the necessary mixture. The manures mentioned are all simple ingredients, and can all be purchased in the Perth Market, and I have, in each instance, given the cost per acre, so that anyone requiring to use these manures can form an idea as to what the cost will be before they make a start, and can then regulate the area under crop in accordance with the amount of money they are prepared to lay out. It is a well-known fact that one acre well manured and looked after will yield a larger crop than two acres poorly manured and badly looked after, crops, like live stock, yield a return in proportion to the amount of food and attention bestowed on them.

PRICES OF MANURES.

It is a fact to be regretted that the price of manures in this State is excessive, and out of all proportion to that charged in the Eastern States, this is mainly accounted for by the small demand and the high rate of freight charged by the shipping companies.

The following may be taken to be about the average price charged in Perth for quantities of not less than two cwt. (bag lots) of any one manure, the price is of course open to alteration subject to the market fluctuations, rate of freight, the terms required by the purchaser for payment, and the quantity required; the man who can afford to purchase a truck load for cash being of course able to secure better terms than those requiring only small quantities and extended credit:—

Sulphate of Potash, containing 53 per cent. of potash, £20 per ton, equal to about 7s. 6d. per unit.

Nitrate of Soda, containing 15 per cent. of nitrogen, £15 per ton, equal to 20s. per unit.

Sulphate of Ammonia, containing 20 per cent. of nitrogen, £18 per ton, equal to 18s. per unit.

Thomas Phosphate, containing 18 per cent. of phosphoric acid, £5 per ton, equal to 5s. 6d. per unit.

Bone-dust, containing 4.5 per cent. of nitrogen, and 17 per cent. of phosphoric acid, £7 10s. per ton.

Superphosphate, containing 25 per cent. of phosphoric acid, at £7 10s. per ton.

Blood Manure, containing 11 to 12 per cent. of nitrogen, at £6 10s. per ton.

UNIT VALUES OF MANURES.

The unit value of a manure is the value of each 1 per cent. of the ingredients contained. Taking sulphate of potash, for an example, a manure containing 53 per cent. is worth £20 per ton; a manure, therefore, containing 54 per cent. is worth 7s. 6d. more; a manure containing 52 per cent. is worth 7s. 6d. less, and so on with the other ingredients. The unit value of nitrogen contained in bone-dust, blood manure, offal, etc., is not so valuable as that contained in the more soluble salts, such as sulphate of ammonia; the value may be taken as about four-fifths, that is to say that if the unit value of nitrogen in sulphate of ammonia is 18s. per unit, that in bone-dust is 14s. 4d.

Phosphoric Acid is contained in superphosphate, etc., in two forms: "water soluble" and "insoluble"; the "water soluble" may be valued at 7s. 2d. per unit, and the "insoluble" at 2s. 8d. per unit. An analysis of superphosphate will state the percentage of "water soluble" and "insoluble." In some cases "citrate soluble" is quoted, this means that the phosphoric acid is insoluble in water but soluble in acid, and is worth about half the difference between the "water soluble" and "insoluble."

For the purposes of comparison I quote the unit values as arrived at from the values of the standard manures in this market and those quoted in Sydney (N.S.W.).

	Sydney.	Perth.
<i>Nitrogen.</i>		
In Ammonium Salts and Nitrates ...	s. d. 12 6	s. d. 18 0
Blood, Bones, Offal, etc. ...	10 0	14 4
<i>Potash.</i>		
Potash Salts ...	5 4	7 6
<i>Phosphoric Acid.</i>		
Water, soluble ...	5 4	7 2
Insoluble ...	2 0	2 8
In Bones, Offal, etc. ...	2 3	3 4

Taking these two sets of figures for comparison, we find that, roughly speaking, the cost of manures in Perth is 40 per cent. over that charged in Sydney, which alone is a considerable handicap to our growers.

Having these unit values near at hand, it is a very simple matter to arrive at the value of any manure offered for sale, supposing, for instance, a mixed manure, composed largely of bone-

dust, is offered for sale containing nitrogen 4·5 per cent., potash 5 per cent., phosphoric acid 20 per cent., we multiply the percentage by the unit value and arrive at the value of the manure, thus:—

			£	s.	d.
Nitrogen	- -	4·5 x 14/4	...	3	4 6
Potash	- -	5 x 7/6	...	1	17 6
Phosphoric Acid	20 x	3/4	...	3	6 8
Value at Perth prices ...			...	£8	8 8

The value at the Sydney rates would be ... 5 16 8

Showing an additional cost to the Western Australian grower of £2 12s per ton.

In submitting the following list of manures of various crops, it must be borne in mind that it is impossible to give a manure that is suitable for every sort of soil and all conditions, and the manures mentioned can only be taken for a fair average soil, and may require to be varied for different districts. It is best to determine what is required by actual experiment, and a very simple way to determine the ingredients deficient is as follows; which is recommended by Ville, a distinguished chemist, as a practical analysis of the soil.

Sow, in close proximity, and upon a similar piece of land, a small patch of wheat and a small patch of peas; the land should be unmanured, and both patches should have received the same previous treatment. The results of these two crops will furnish you with a guide as to the quantities of nitrogen, phosphoric acid and potash available in the soil quite as reliable as a chemical analysis.

If the two crops flourish equally well, your land is well supplied with the three ingredients above named.

If the wheat crop fails and the peas flourish, nitrogen is wanting, and the advisability of applying a nitrogenous manure becomes plain.

If, on the contrary, the peas are sickly, the cause is probably deficiency in potash and phosphates, which must be supplied.

MANURES FOR VARIOUS CROPS.

Manures for Wheat and Cereals.

	Quantity.	Cost.		
		£	s.	d.
Bonedust, or boiling down refuse containing 7 per cent. nitrogen and 9 per cent. phosphoric acid	560lbs.	1	17	6
Superphosphate	560lbs.	1	17	6
Sulphate of Potash	168lbs.	1	10	0
	11½ cwt.	5	5	0

This mixture will cost, approximately, 9s. 1d. per cwt., and should be applied at the rate of 3cwt. per acre, and will cost 27s. 3d. per acre.

It will supply to the ground per acre:

Nitrogen	...	...	...	10lbs.
Phosphoric Acid	...	...	...	47lbs.
Potash	...	...	...	22lbs.

or, if using Thomas phosphate, apply when sowing seed---

				Cost.		
				Quantity.	£	s. d.
Thomas Phosphate	...	...	336lbs.		0	15 0

And as a top dressing in spring---

Sulphate of Ammonia	...	...	448lbs.	3	12	0
Superphosphate	...	...	448lbs.	1	10	0
Sulphate of Potash	...	...	336lbs.	3	0	0
				11cwt.	8	2 0

or about 14s. 6d. per cwt.

Apply the mixture at the rate of about 1cwt. per acre in spring, and the total cost will be 29s. 6d. per acre, and will supply about:

Nitrogen	...	...	...	8lbs.
Phosphoric Acid	...	...	...	64lbs.
Potash	...	...	...	14lbs.

Thomas phosphate contains a considerable percentage of lime, and is not so satisfactory on a limestone soil as superphosphate, but in clayey or peaty soils, or soils deficient in lime, it is especially valuable on account of the quantity of lime it contains. In mixing manures together, Thomas phosphate must not be mixed with a manure containing sulphate of ammonia, as the lime sets free the ammonia and the nitrogen is lost. This fact must be borne in mind, if it is desired to substitute Thomas phosphate for Superphosphate in any of these mixtures.

Oats

Require about the same manure as wheats, except perhaps a little more potash, as the straw of the oat contains more potash than that of wheat.

Barley,

If for malting purposes, requires less nitrogenous manure, as the grain produced by the application of nitrogenous fertilizers affects the keeping qualities of the beer.

Pasture Grasses.

				Cost.		
			Quantity.	£	s.	d.
Sulphate of Ammonia	...	...	448lbs.	3	12	0
Superphosphate	...	...	560lbs.	1	17	6
Sulphate of Potash	...	...	224lbs.	2	0	0
				<hr/>		
11cwt.				£7	9	6
				<hr/>		

Cost of mixture per cwt., 13s. 7d.

Apply at time of sowing seed, or as a top dressing in established pastures, at the rate of 3cwt. per acre, and the cost will be £2 0s. 9d., and will supply to the ground per acre :—

Nitrogen	...	...	24lbs.
Phosphoric Acid	...	...	37lbs.
Potash	...	...	28lbs.

Leguminous Crops.

BEANS, PEAS, AND CLOVERS.

				Cost.		
			Quantity.	£	s.	d.
Bone Dust	...	...	168lbs.	0	11	3
Superphosphate	...	...	560lbs.	1	17	6
Sulphate of Potash	...	...	448lbs.	4	0	0
				<hr/>		
10½cwt.				£6	8	9
				<hr/>		

Cost of mixture per cwt., 12s. 4d.

Apply at the rate of 3cwt. per acre, it will cost 37s., and will supply to the ground per acre :—

Nitrogen	...	...	2lbs.
Phosphoric Acid	...	...	40lbs.
Potash	...	...	60lbs.

Leguminous crops require no nitrogen, they having the power of obtaining their supplies of nitrogen from the air. The manures they require are lime, potash, and phosphoric acid. In soils that are deficient in lime a heavy dressing of lime is necessary for this crop.

(To be continued.)

TWO PREVALENT BLIGHTS.

APPLE AND PEAR POWDERY MILDEW.

A. DESPEISSIS.

This disease, which, from its appearance at a later stage, is also known as "Fire Blight," is more widespread in some seasons than others. It affects the young shoots of pears and apple trees, and stunts their growth. Young trees are more especially attacked. In spring and early summer it is more noticeable; the spores at that period are blown about and set on the tender twigs of the branches whilst the dew is still on the leaves. There they germinate and live as parasites on the outer surface of the leaves and twigs, stunting their growth and causing the leaves to curl up, and the leaves and young wood to dry. At its initial stage this fungus make the leaves look as if they had flour cast over them.

The disease is caused by the *Podosphaera* fungus, of which several varieties are known, viz. *P. oxyacanthæ*, D.C.; *P. Kunzei*, Lev.; *P. tridactyla*, Wallr., which also attacks cherries and plums.



Powdery Mildew.
(*Podosphaera fungus*.)
From Nature.

REMEDIES.

Winter spraying with the salt, sulphur, and lime wash, or with strong Bordeaux mixture, by destroying a great many spores—the minute grains in flowerless plants, such as fungi, which are analogous to seeds—thus materially checks the disease.

Later on, when the grayish white mealy mildew appears, sulphur fumes are found very efficacious. This can be done by spraying on to the leaves a weak solution of Potassium sulphide (Liver of Sulphur, costing 2s. to 2s. 6d. per lb.), at the rate of 5ozs. to 10ozs. in 10 gallons of water, or by dusting flower of sulphur over the plant threatened with attack. This sulphuring prevents the germination of *Conidia*—a peculiar kind of reproductive cell

found in certain fungi, and often containing minute organised cells essential to reproduce the species. Besides sulphuring, various copper sprays give very good results, while at the same time they act as preventive against the false mildews – scab and rots.

Whether sulphur or copper preparations are used, the protective agent has to be frequently applied so that the young growing shoots, flowers, fruits, leaves, and all parts liable to attack may be protected.

Allied to this fungus, and amenable to the same treatment, are the rose-mildew fungus, the gooseberry-mildew, the vine-powdery mildew or oïdium.

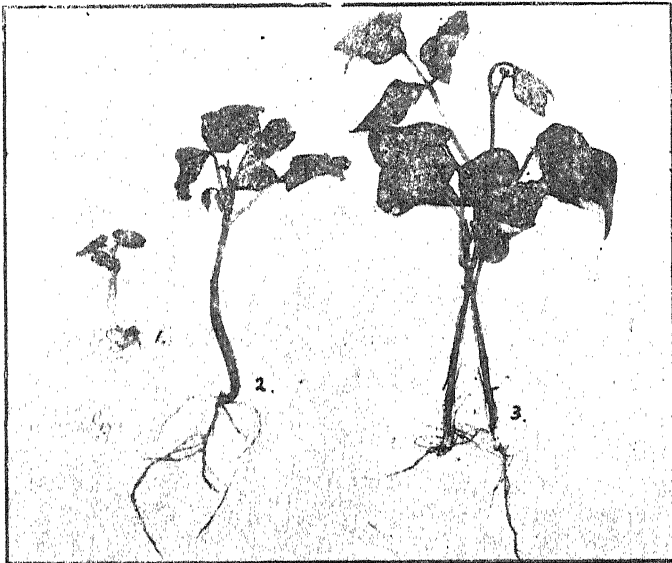
When the disease is just showing, pinching off the affected shoots and burning them to guard against the dissemination by the wind and other agents of the spores of the fungus will check the blight.

BEAN ANTHRACNOSE.

Colletotrichum Lindemuthianum (Sacc. and Magn).

This disease, caused by the above fungus, levies a heavy tax on bean crops, both in Europe, America, and Australia. The affected plants may be entirely destroyed, or they are so affected that an inferior crop results.

All parts of the bean plant are affected.



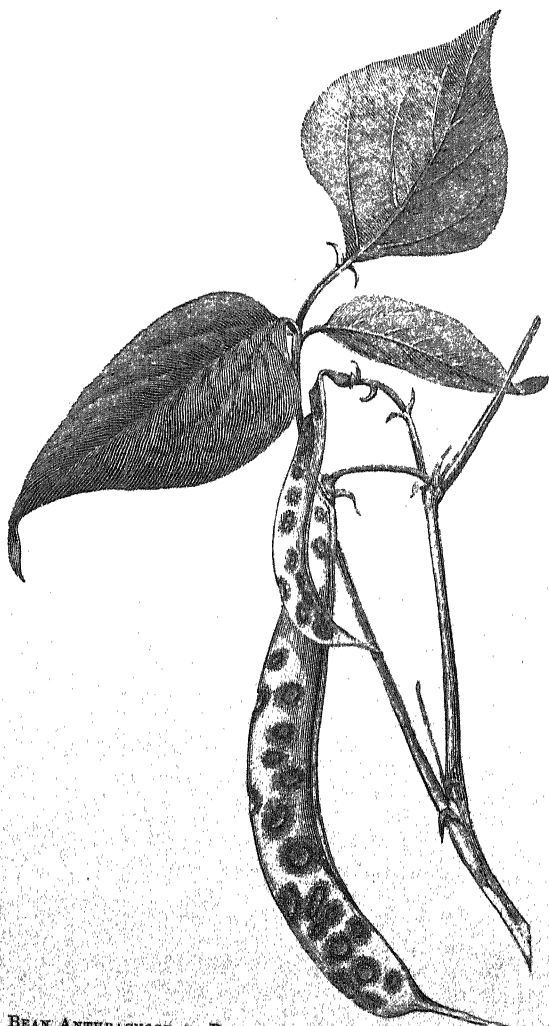
1. Cotyledons affected with anthracnose; 2. Stem swollen and hollowed at the lower extremity by an attack of the fungus; 3. Same with stem split open to show the disease. (From Nature.)

If diseased seeds are planted, the infection may be often noticed on the seed beans (*cotyledons*), as is illustrated on Fig. 1, soon after they

appear above ground, or it attacks the stem (Figs. 2 and 3), eating through it, and causing the affected plant to collapse as if it had been eaten through by cutworms. At this stage, a considerable proportion of the plants are destroyed, the stems assuming a dark colour and perishing. Small sunken pustules are (Fig. 2) seen on it.

Many of those plants which have survived the earlier attacks of the fungus now fall a prey to it; the leaves and the leaflets becoming spotted and pitted, and the yield being greatly reduced in consequence.

In the next stage the pods are attacked and show black or brown pustules with red borders.



BEAN ANTHRACNOSE ON PODS (*Agricultural Gazette, N.S.W.*)

When thus affected they fill badly or do not fill at all. At this stage the disease is often spread in the market to sound beans which may come in contact with them.

Lastly, when the plant has resisted the disease during the period of its growth, the seeds may be affected. They then are light, wrinkled, marked with pits, and discoloured. On seeds, the spores of the fungus are carried over the season until they are planted again to renew the infestation.

REMEDIES.

Diseased seeds beget diseased crops. Therefore all light, cracked, wrinkled, and discoloured seeds should be discarded when sowing beans.

If large fields are to be sown, the readiest plan of insuring the planting of sound seeds would be to "pickle" them. For this purpose the seeds may be subjected to the hot-water treatment, and dipped for five minutes in water at 130deg. F., or for ten minutes in water at 120deg. F. They may be soaked for an hour or so in Bordeaux mixture, full strength, or in a strong solution of ammonio-carbonate of copper, viz., carbonate of copper, 3oz.; ammonia, 1 quart; water, $4\frac{1}{2}$ to 5 gallons. A solution about three times as strong as that used for spraying.

Heavier seeding is to be recommended to make up the possible loss caused by the treatment.

From its first appearance above the ground, the beans should be protected against the invasion of the disease. The first spraying is best done when the first pair of leaves show; a second should follow eight or ten days later, and a third, if required, as soon as ever any of the symptoms of the disease set in.

CROWDING CALVES.

Let the calves have sun and air. Never let them crowd themselves by herding on one spot till it gets dirty. Change their paddock frequently; prevention is better than cure. All calf troubles arise from want of sun and air. Till they learn to drink one sees half a dozen to a score huddled together in some hole of a place bound to breed trouble. A good plan, and costing a trifle, is to choose a fence facing the North or North-East, and erect a line of sheds, covered by one length of 5ft. palings, pitched in front to drip over the third rail at the back. Each calf can be tied and toggled through the back wall, with just length enough not to tangle each other. Ten days or a fortnight of this teaches them to drink, and is an education they never forget. All young animals should be rope-restrained for a time; it saves trouble in after years, when the heifers calve and the steers come to the yoke, or the colt to be haltered.

VISIT TO GOOSEBERRY HILL.

REPORT BY MR. P. G. WICKEN.

In a report on a recent visit to the Upper Darling Ranges Mr. Percy G. Wicken, field officer to the Department of Agriculture, states :—

“ During the limited time at my disposal I visited as many places as possible, and was much struck by the splendid growth and healthy appearance of the young trees and vines. I was shown a number of trees which at two years old showed a much better growth than many in other parts at twice that age. Apples, pears, and stone fruits are all doing well. The citrus trees are all looking exceptionally healthy, and at the present time promise a heavy crop. The crops of strawberries are a feature of the district. Nearly every homestead has its acre or half-acre of strawberries on which all members of the family are kept going from early morning till late at night picking the ripe berries and packing them in neat punnets for despatch to the Perth market on the following day. The prices realised by the growers for their strawberries this season, although not as high as those obtained last year, are still satisfactory, and those who work their beds in a businesslike manner obtain a handsome profit.

“ Other crops, such as Cape gooseberries, potatoes, etc., are all doing well. The settlers, taken as a whole, are contented and satisfied with their prospects. They seem to be in a fair way of prosperity, and can look forward to the future with confidence. The soil is composed mostly of an ironstone gravel, the tops of the hills being very stony, the soil shallow and of very little use; but in some of the hollows and along the creeks there are ideal places for fruitgrowing and gardening operations. Most of the homesteads are on small creeks or springs, which, owing to the hilly formation of the country, they are able to dam up and to irrigate their cultivation areas by means of gravitation, thereby enabling them to grow crops of vegetables throughout the summer months, as well as to obtain an abundant supply of water for household purposes.

“ I was sorry to notice that there is a good deal of disease among the fruit trees. In a number of the citrus trees the young growth was attacked by the black aphid, and a good deal of black scale and other diseases were to be observed. One orchard, occupied by some Chinese, was a breeding ground for all kinds of pests, much to the disgust of their neighbours, some of whom mentioned that there ought to be an Act passed to prevent Chinese from occupying orchards, as it is almost impossible to prevent them from breeding disease in their gardens.

“ The great drawback to this promising district is the means, or lack of means, of communication. There is a railway run by a private company to suit itself, but certainly not to suit the public.

The company will condescend to carry passengers, and even goods if they like, if you are on the line when the train passes, but at what time it will pass is a problem which has to be decided every day by personal experience. It may pass between 6 and 7 o'clock in the morning, and the would-be passenger sits down on a stump by the side of the line, and waits as patiently as he can. It may pass about 7 a.m., or the driver may have his dinner before they start, and run down in the afternoon, by which time the would-be passenger is not in an amiable frame of mind towards the company. To reach Gooseberry Hill from Perth you have to leave by the 9 a.m. train, and my experience was to arrive there at 2:30 p.m. I was then shown on a plan by a resident that we were just 12 miles from Perth in a straight line, and could, by walking about half a mile, plainly see the city.

"The other means of communication is a road which has been considerably improved of late. It is 15 miles by road, of which three to four miles is loose sand, which makes even walking hard work. As the railway is not to be relied on, most of the fruit, etc., is brought into the city by cart; but the road is so heavy that it takes three or four hours to travel in with a light trap. This is a great handicap with perishable fruit. About two miles of this road have recently been made at a cost of £10 per chain, and is now in good order; and if means could only be found to complete the road or to arrange for a regular service of trains, the prosperity of the district is assured; but at present settlers are dreadfully handicapped by want of communication."

THE SOUTH AFRICAN TICK.

It was mentioned at a recent meeting of the Masterton (N.Z.) Chamber of Commerce that there was a danger of the introduction of cattle tick from South Africa into the colony. The matter was of grave importance to the agricultural community. There were hundreds of men returning from South Africa, and no precautions were apparently being taken to prevent the introduction of the cattle tick. From inquiries made by one speaker, he learnt that by spreading a handkerchief on the ground thousands of the tick could be collected, and it was when the men were out camping that they collected the tick. If it once came to Australasia, it would "come to stay," and would mean the ruin of the cattle. It was a serious matter. Mr. Donald said he understood that the men were covered with tick, and also the ships. The Chamber decided that the Minister of Agriculture be written to, inquiring if any precautions were being taken to prevent the introduction of cattle tick from South Africa.

REPORT BY DAIRY EXPERT.

A. CRAWFORD.

Mr. Crawford, Dairy Expert to the Department of Agriculture, who has just returned from a lengthy trip, reports to the Secretary as follows:—

“Since the end of September I have been travelling through the country districts, attending the agricultural shows and lecturing. Up to the present I have visited Dongara, Greenough, Geraldton, York, Wagin, Guildford, Bunbury, Busselton, Capel, Donnybrook, Bridgetown, and Glentworth. I have also to visit and lecture at Harvey, Coogee, Wagerup, Balingup, Jandakot, King River, Narrogin, Pingelly, Katanning, Chapman, Northampton, and a number of other places where definite arrangements have not yet been made.

“The subjects I have been dealing with principally have been dairying and poultry keeping, the latter especially, as I find there is a great lack of knowledge amongst the farmers as to what the different breeds of fowls are most adapted for, and many farmers who say that poultry keeping does not pay, find it so because they have got the wrong kinds. Most of my lectures have been illustrated by lime-light views, and I find this method of dealing with the subjects very satisfactory indeed. With one or two exceptions I have had large and appreciative audiences, and have been asked to visit the places again and lecture on other subjects.”

THE RED PEAR MITE (*BRYOBIA PARTENSIS*, GARMAN).

By MR. G. COMPERE.

“In the past this pest has, in this State, been mistaken for and treated as the Red Spider (*Tetranychus telarius*), whereas it should be treated altogether differently, and the object of this article is to correct this error and not for the purpose of writing anything with reference to its life, history, or description, as it would be a very difficult matter to write a better description than that written by Mr. Froggatt, Government Entomologist of New South Wales, and published in “Miscellaneous Publication” No. 298, page 22, which is as follows:—

The Red Mite (*Bryobia partensis*, Garman). From April to early summer a reddish tint will be frequently noticed upon the bark of both apple and pear trees, but chiefly the latter; sometimes, when the trees are badly

infested, even the stakes are thickly covered. Upon examination with a lens it will be found that this is caused by countless numbers of tiny round crimson eggs, clustered together in every curve or irregularity in the bark. Later on, when the buds burst out into leaf, these little creatures hatch, leaving an empty white shell behind, attack the leaves from the underside, sucking up the juice of the tree, and causing them to become mottled and fall off prematurely.

This mite is about twice the size of the red "spider," of a bright red colour, with four pairs of legs, the front pair much longer than the hind ones.

Heavy rains seem to destroy great numbers, and though the pest is so common and numerous in many orchards in some parts of the Colony, it does not seem to make much headway or do much damage in this country, yet in some parts of America it is looked upon as very destructive to fruit trees.

While Mr. Froggatt does not mention it as attacking almond trees in that State, the writer noticed them attacking that tree in both New South Wales and Victoria, and they also attack that tree in this State.

In the United States of America, this mite is known as the Clover Mite, and in some sections considered quite a serious pest to both apple and pear trees, and in Bulletin No. 35, October, 1900, published by the New Mexico Agricultural Experiment Station, Mr. T. D. A. Cockrell publishes an account together with a good figure of this mite.

Treatment.—The lime, sulphur, and salt mixture, or kerosene emulsion should be used, and should be applied early in the spring before the buds begin to swell.

This mite having been mistaken for the Red Spider (*Teranychus telarius*), it might as well be stated here that the latter is not a pest here, or, at least, to the extent of doing any damage to the orchardists. It being held in subjection by the little lady-bird, *Symnus vagnas*, Black., one of the smallest known lady-birds. My attention was first called to this useful little beetle by Mr. H. Tryon, Government Entomologist of Queensland; there, as in all other Australian States, it keeps the red spider in check. Garden plants and French beans have been noticed damaged a little on one or two occasions during my travels in Australia, but never any fruit trees. Yet it is a very serious pest in orchards in some parts of the world, where it has no natural enemies to hold it in subjection.

NATIONAL SHOW.

Secretaries of societies are notified that the date for sending in names for intending exhibition at the forthcoming National Show of Produce, to be held in March next, has been extended from 1st December, 1901, to 1st January, 1902.

IMPORTATION OF INDIAN ORANGES.

The late Minister for Agriculture, Mr. C. Sommers, having submitted to the Department of Agriculture the following paragraph relating to the famous Sylhet orange of India, the matter was referred to Mr. Despeissis, the viticultural and horticultural expert of the department, whose report also follows :—

Our orange-growers should endeavour to obtain seeds of the famed Sylhet orange. Dr. Bonavia, in the *Gardeners' Chronicle*, says that this fine variety is grown solely from seed in Eastern Bengal, and is sent in large numbers to Calcutta. The tree is an upright grower, the fruit is of the loose-skinned kind and of fine quality. At Shalla, amongst the hills, there was an orange-garden of about 1,000 acres, and one might walk for a good hour or two, always under the shade of orange trees, without reaching the limits of cultivation. Ripe oranges of this variety were sent from Lucknow to England, and although the fruits decayed on the way, the seeds remained fresh; they were sown, and a number of plants were the result. The seedlings fruit in five or six years. As the Sylhet orange is to be had in many parts of India, there should be no difficulty in obtaining seeds, and there seems no reason why this variety should not do well in Australia.

Oranges grown from seeds, seldom reproduce without alteration the characteristics of the parent plant, the flowers being often cross-fertilised by bees and other insects. The "Sylhet" of Calcutta is, however, one of the varieties which show fairly constant results when raised from seeds.

The Director of the Botanical Garden at Calcutta, would, I dare say, undertake to forward to this Department a few cases of Indian oranges, and also a Wardian case with plants raised from layers from trees noted for the excellence of their fruit, or raised by budding on seedling trees.

There are several varieties of Indian oranges I would like to see introduced, and a case each of the following varieties could be shipped to Western Australia. The fruit should be carefully picked and clipped at the stalk and not pulled; it should be well coloured, but not fully ripe, and should be free from punctures caused by thorns or by scale insects. The cases should be firmly packed, and each fruit wrapped up in tissue paper three or four days after picking, so as to rid the rind of any surplus moisture, and thus minimise the chances of bruising. These oranges would be about 18 days in transit, and should land in good order at Fremantle.

- (1.) The "Sylhet" of Calcutta, derives its name from the station of that name in the Khosia Hills of Eastern Bengal, where it is said to be generally propagated from seeds. The "Sylhet" is a tall upright tree and belongs to the "Suntolah" group of loose-skinned oranges; as does also

- (2.) The "Nagpore" of Bombay, which is much like the "Sylhet;" the tree of this variety, however, is of a spreading habit. Both are excellent varieties for exportation.
- (3.) The "Suntolah," a very small but extremely sweet orange, which grows wild in the hot, humid part of India, between the Himalayas and the Ganges. Naturally, it requires very little attention. It is sweet almost before it is quite yellow.
- (4.) The "Keonla" greatly recommended on account of its lateness. Long after the oranges have been gathered the "Keonla" hangs on the tree, when it turns a beautiful dark red colour, and only then becomes sweet.
- (5.) The "Mussemby" brought from Poona and sold in Bombay. It is said it can be left to hang on the tree for a whole year without hardly deteriorating. The fruit is orange yellow, and shows longitudinal furrows from stalk to eye.

The Minister having approved of the expert's recommendation, the Secretary of the Department of Agriculture has communicated with the Director of the Botanical Gardens, Calcutta, to procure both fruit and plants of the varieties enumerated in the above report, and ship them to Perth.

On arrival of the fruit they will be submitted to leading growers and dealers, and thus an opportunity will be afforded of comparing some of the most famous oranges from oriental stock with the varieties from Portuguese origin mostly cultivated in Australia.

LIME AND ITS APPLICATION TO THE SOIL.

At a recent meeting of the Renmark branch of the South Australian Agricultural Bureau, Mr. W. H. Harrison, M.A., read the following paper:—Lime is very extensively used as a fertiliser, but its action is not generally well understood, and serious mistakes often occur from its indiscriminate use. Most soils contain all the elements of plant food in varying quantities, but however abundant the presence of most of these essential constituents, if anyone of them be absent the soil is perfectly barren, and if present in insufficient quantity the resulting crops are unsatisfactory to the extent of that deficiency. Lime cannot be classed among these

deficient substances, for although it enters into the composition of almost all forms of vegetable life, its various compounds are so widely and generally distributed that it would be a very rare circumstance for any sample of ordinary soil to be found on analysis not to contain sufficient lime for the requirement of any cultivated plant. Then it may be asked, how is lime a fertiliser? Anything is a true fertiliser which causes a plant to make more vigorous growth and yield a better crop; and lime does this in a twofold manner, viz., chemically and mechanically. First as to its chemical action. All plant food to be available must be in a soluble condition. Otherwise it is like human food under lock and key. All soils contain animal and vegetable matter in varying proportions and in various stages of decomposition. Now lime, in its caustic condition, is one of the most powerful agents of decomposition, and where from defective drainage or other causes the land is "sour," and where organic matter does not readily decompose, the application of caustic lime often works wonders, causing these previously inert substances to yield an abundant supply of available plant food. Probably this use of lime on land damaged by seepage would act beneficially. Again, lime and its compounds sometimes react with injurious mineral substances, producing useful or harmless compounds, *e.g.*, the action of gypsum on carbonate of soda. The mechanical action of lime on heavy clay lands is an important aid to fertility, causing the soil to become friable, and thereby giving free access to air and water. This mechanical action is shared by several of its compounds, such as gypsum, powdered chalk, pulverised shells, etc. The common mistakes in the application of lime as a fertiliser are the following: When its chemical action is required on sour, boggy land, it should be spread and ploughed in as soon as possible after being slaked. It is often allowed to lie in heaps for weeks and months, when it absorbs carbonic acid from the atmosphere, and becomes gradually converted into carbonate of lime or chalk. When spread and allowed to remain for some time before being ploughed in the mischief is still greater. Considerable damage sometimes occurs from over-liming. Since caustic lime greatly promotes decomposition, there is danger of bringing too large a proportion of plant food into available form, resulting in a heavy crop in the ensuing season and comparative barrenness for several years after. It is a common practice to add lime to nightsoil and other animal manures. Caustic lime sets free the ammonia, thus depriving the manure of one of its most valuable constituents.—*The Observer*.

AGRICULTURAL EDUCATION IN FRANCE.

By C. B. SMITH, *from the Year Book, U.S.A.*

INTRODUCTION.

France has a remarkably complete system of agricultural education. It is more comprehensive than our own, in that it reaches a wider range of people, and its different parts are more co-ordinated, the whole system being under the control of one central authority. It begins in the rural primary schools with the simplest facts of agriculture, extends through every phase of practice and theory in special schools, and culminates in a national institute, where the highest forms of agricultural instruction are given by a staff of the first men of science of France.

In this system there are schools for the sons of farm labourers who expect to continue in the vocation of their fathers; schools for the sons of peasant proprietors and the small-farmer class who expect to return to the farm; schools for the sons of landed proprietors who will manage estates and act as leaders in agricultural progress; schools for training teachers of agriculture, managers of agricultural technical industries, and high officials for serving the state at home and abroad in agricultural positions. Not only do these schools give instruction in agriculture in general, but there is also extensive provision made for the conduct of special schools to meet the wants of different sections of the country. These include schools of dairying, viticulture, poultry raising, irrigation and drainage, cheese making, silk making, fish culture, forestry, horse breeding, technical agricultural industries, horticulture, veterinary science, etc. In this article it is proposed to outline the general provisions of the scheme observed in France for agricultural instruction and to describe some of the more important schools.

NATIONAL DEPARTMENT OF AGRICULTURE.

At the head of the whole agricultural system in France is the National Department of Agriculture. The department was created in 1881 for the purpose of promoting the interests of agriculture. It is made up of four great technical divisions, namely, agriculture, breeding of horses, forestry, and agricultural hydraulics. The purpose of the department is to obtain and distribute agricultural information, to stimulate agricultural research and teaching, and to further the agricultural interests of France. To aid in this work an extensive series of publications has been instituted. These publications report the laws of the country relative to agriculture and the official acts of the ministry of agriculture, give the annual decennial agricultural statistics of the country, and contain agricultural reports, memoirs of specialists, and papers on different phases of agriculture. Various reports of agricultural schools, departmental professors, and experiment stations are also published.

Supplementary to these publications, the ministry encourages authors by buying and circulating agricultural books acknowledged to be useful to agriculturists. From £1,000 to £1,500 is expended each year in this way.

The issuing of publications, however, is only one of the means of encouraging agriculture. Far more effective than this is the extensive system of agricultural teaching adopted. Since 1898 the supervision of this teaching has been intrusted to a "Superior Council of Agricultural Education." This consists of 30 members, and is charged with the general supervision of all institutions affording agricultural instruction founded or subsidised by the ministry of agriculture. "All proposals for the formation of new schools are submitted to the council, and it receives the reports of the directors and professors. The council meets at least once a year and forwards a general report to the minister of agriculture, containing its views respecting improvements or alterations of the system as a whole. The minister of agriculture is the president of the council. * * * Members other than those holding their positions ex-officio are appointed for four years, one-half of the number retiring every two years. Fifteen members of the council form a permanent association, which meets to consider urgent matters whenever summoned by the minister of agriculture."

For the more detailed work of inspection there are three inspectors-general. These organise the Paris and district agricultural shows and inspect the national schools of agricultural and the Agronomic Institute at Paris. In addition, there is one inspector for each of the eight agricultural districts of the country. These inspectors have the supervision of the lower agricultural schools and of the departmental and special professors. They also organise and preside over district shows.

With this brief survey of the general system of supervision, some of the more important institutions provided for agricultural teaching may be noticed.

THE AGRONOMIC INSTITUTE.

This is the highest institution giving agricultural instruction in France. It is located in Paris, and was first opened to students in 1876. It is a post-graduate school of university type for all other agricultural institutions in France, except the School of Forestry at Nancy and the School of Horse Breeding at Le Pin. Its purpose is to qualify students for (1) agriculturists and proprietors of estates; (2) professorships in the national and practical schools of agriculture and for departmental and normal-school professors; (3) administrators, capable of taking charge of special agricultural investigations, as inspection, phylloxera investigations, etc.; (4) directors of agricultural experiment stations; (5) chemists or directors of agricultural industries (sugar making, distilling, starch making, manufacture of fertilisers), or agricultural engineers (mechanical, drainage, irrigation, etc.).

The institute has at its disposal suitable laboratories and buildings, and in addition about 65 acres of land, which is used for the growing of plants and research work of the professors, for the object of the school is not only the teaching of all the known facts of the sciences relating to agriculture, but also experimentation of new fields. The teaching staff, consisting in 1899 of a personnel of sixty-five, contains among its members many of the highest scientific authorities of France. Such familiar names as Boussingault, Hervé-Mangon, Schlösing, Aimé Girard, A. Carnot, Risler, Delesse, Breuil, Tassy, Prillieux, Müntz, etc., are found on the first faculty roll of the institution, some of whom are still occupying chairs in the school.

Candidates for admission to the school must be at least 17 years old, and are subject to competitive examination in the natural sciences, French composition, and descriptive geometry. For graduates of universities or the national schools of agriculture and veterinary science, the examinations are somewhat modified. Under certain conditions students may be admitted to the lectures without examination, but are debarred from laboratory work, and are not granted a diploma. Tuition is about £20 per year for regular students, and £2 for students attending the lectures only. The school has no dormitories.

Work begins at 8 o'clock a.m. and continues until 4 p.m., with an intermission of one and one-half hours at noon for lunch. All exercises and studies are compulsory. There are six scholarships having an annual value of about £40 each, and four of a value of £20 each, offered by the State. Free tuition goes with these scholarships. There are ten other scholarships giving free tuition alone, and in addition certain other scholarships offered by the city of Paris and Seine department to native-born students.

The course of study occupies two years, with a vacation of three months each year. Two months of each vacation are required to be spent in actual agricultural practice, either in France or abroad, and a report of the work must be handed in. Excursions to fairs, stock markets, etc., are a prominent feature of the course. The subjects each year of the course are as follows :—

FIRST YEAR.—Vegetable physiology and anatomy, descriptive botany, mineralogy and geology, mathematics, agricultural mechanics, physics and meteorology, general chemistry, general agriculture, viticulture, general zootechny, political economy, rural hygiene, agricultural zoology, and the anatomy and physiology of animals.

SECOND YEAR.—Vegetable pathology, micro-organisms, agricultural chemistry, special and colonial crops, comparative agriculture, aboriculture and horticulture, agricultural machinery, agricultural hydraulics, special zootechny, agricultural technology, farm law, rural economy, economic forestry, and agricultural bookkeeping.

Upon the completion of the course the degree of agricultural engineer is granted. The first 60 who have attained a standing of at least 70 per cent. for the whole two years are exempted in time of

peace from two of the three years' compulsory military service. The two students standing highest on the examination list are eligible for three years' special missions either in France or in foreign countries, with a Government allowance of £120 per annum. The first 10 or 12 on the list, depending on the needs of the State for foresters, are eligible to studentships in the National School of Forestry at Nancy, and are given an allowance of £60 per year. The three highest among those desiring work in the Government horse-breeding school are made eligible for such positions. Nine others, selected on the basis of scholarship, are eligible to positions equivalent to one-year fellowships either in the laboratories of the institute or elsewhere in agricultural industrial occupations, with an allowance of £4 per month. Former students at the institute who possess the bachelor's degree in addition to the diploma of the institute are eligible for attachéships, consular, and other administration positions.

A recent report shows that of 882 graduates of this school, 91 per cent. are engaged in agricultural occupations or industries immediately related thereto.

NATIONAL SCHOOLS OF AGRICULTURE.

There are nine national schools of agriculture in France—three of general agriculture, three of veterinary science, and one each of horticulture, dairying, and technical agricultural industries.

NATIONAL AGRICULTURAL SCHOOLS.

The most noted of these schools is located at Grignon, near Paris. This school was founded as a private institution in 1826, and is the oldest agricultural institution in France. It was placed partly under Government control and patronage in 1849, and in 1872 was reorganised, together with the agricultural school at Rennes in western France and the school at Montpellier in the extreme south of France, into a national school of agriculture, under the direct control of the State, and supported entirely by it.

The three national schools of agriculture are more practical in nature than the National Agronomic Institute, and correspond more nearly to the State agricultural colleges in this country. Their purpose is to fit young men for positions as managers of estates and as teachers of agriculture. The teaching in these schools is both theoretical and practical. The course covers two and one-half years at Grignon and Montpellier and two years at Rennes. Only day students are received at Rennes. At Grignon and Montpellier students may obtain full board, or half board, or they may board away from the school. Tuition with full board costs £48 per year at Grignon, and £40 at each of the other two schools. With half board, tuition is £22 10s. per year. Day students pay £16 per year. Students bearing the lectures and taking practical work, but who do not take laboratory work, pay £8 per year. They receive neither diploma nor certificate. Military discipline is observed at the schools, and is very strict. Deviation from the rules without

previous permission or failure at the sessional examinations entails expulsion. Candidates for admission to the full course in these schools must be at least 16 years old, and are subject to both a written and an oral competitive examination in French, elementary mathematics, physics, chemistry, and natural science. Those who pass the written examinations are permitted to take the oral examination. The number of vacancies in the school is fixed annually by the Minister of Agriculture, and seldom exceeds forty. Men only are admitted. Students standing highest on the examination list have first choice as to the school which they will enter.

Upon the completion of the course the diploma of the school is conferred by the Minister of Agriculture. It carries with it two years' exemption from military duty, and counts a certain number of points on the entrance examination at the National Agronomic Institute.

The teaching in the different schools is made to conform largely to the agricultural requirements of the districts in which they are located. Thus, at Grignon general agriculture, as the growing of cereals, roots, and forage crops, the breeding of stock, pasturage, and the general agriculture of northern France are dealt with especially. At Montpellier the farming is more subtropical, and the cultivation of the orange, olive, mulberry, and the vine, and the processes of wine making are studied especially, as well as methods of irrigation and the replanting of moorlands and mountain sides. The school has given special attention also to parasitic diseases, the combating of the phylloxera, and in renewing the destroyed vineyards of the district. The school at Rennes is located in an important cider-producing and pasturage district, and hence much attention is given to these subjects.

The courses of study in the different schools are very similar, only slight differences appearing in the more practical part of the work. The course at Grignon may be selected for illustration: It consists of agriculture, botany, general, and agricultural chemistry, economics, rural legislation, rural engineering, construction and repair of agricultural machinery, physics, meteorology, agricultural technology, sylviculture, viticulture, and pomology. Lectures are also delivered by specialists in geology, mineralogy, horticulture, and entomology. The students also receive instruction in military tactics.

Connected with each school is a farm for practical work, an extensive library, and well-equipped laboratories. The farm at Grignon contains 321 acres of arable land, and 370 acres of woodland, besides various kitchen, botanical, and other gardens, especially adapted to the study of certain branches. Specimens of the best breeds of sheep, cattle, pigs, and poultry are kept, and experiments made with different crops and fertilisers. Attached to the institute as annexes are several establishments for making researches and experiments. These are the poultry farm at Joinville le Pont, in the neighbourhood of Paris; an experiment station for determining the best kind of seeds to be sown, when to

sow them, and when to harvest; another for experimenting with different kinds of agricultural machinery; a laboratory for the special study of fermentation as applied to brewing, and to wine, cheese, and butter making; and a laboratory of vegetable pathology, where plant diseases are studied. The machines are taken apart and reassembled by the students, and their uses and modes of repair explained by expert machinists.

At Montpellier a school for the breeding and study of silkworms has been organised for the better instruction of the students, and a meteorological department added for the same purpose.

These national schools train the major portion of the leaders in French agriculture. They supply most of the departmental and special professors of agriculture, the teachers of the lower agricultural schools, and the managers of estates and technical agricultural industries. The many receive higher agricultural instruction in these schools, while but comparatively few are able to take post-graduate work at the National Agronomic Institute.

NATIONAL HORTICULTURAL SCHOOL.

The National School of Horticulture at Versailles was established in 1873. The old kitchen garden of Louis XIV. was placed at the disposal of the school for practical work and demonstrations. The place consists of about 25 acres of fruit and vegetable gardens, greenhouses, forcing houses, etc. The institution has a three years' course in theoretical teaching and practical horticultural operations. Tuition is free. Pupils board themselves. The age of admission is between 16 and 26. Students must be physically capable of performing manual labour, and are subject to a competitive written and oral examination. The number admitted each year is limited to forty. There were seventy-seven applications for admittance to this school in 1900. The student body is made up largely of the sons of the labouring and middle classes. Some eighteen scholarships in this school are offered by the state and by various departments and agricultural societies to the students who receive the highest entrance examination marks. Scholarships are about sufficient to cover the board and lodging of the holders. The teaching force of the school consists of twelve professors and four chief gardeners and overseers. The course includes instruction in orchard and small-fruit culture and the growing of vegetables, flowers, and ornamental shrubs in the open and under glass, nursery methods, greenhouse architecture, elementary and descriptive botany, bookkeeping, drawing, the English and French languages, leveling as related to horticulture, elements of mathematics, physics, meteorology, chemistry, geology and mineralogy, pomology, zoology, and horticultural entomology.

Theoretical teaching in these subjects is supplemented by practical work in the vegetable garden, forcing house, botanical garden, orangery, grape and peach houses, nursery, rosary, flower garden, and on the lawns, walks, and terraces of the grounds. Laboratory work in physics, chemistry, and botany is also given.

The school hours are from 6 a.m. to 9 p.m. in winter, and from 5 a.m. to 9 p.m. in summer, with intervals of one and one-half hours for meals. Four hours in winter and two and one-half hours in summer are given to theoretical teaching. At the end of each two weeks pupils make a report to the director on their work. In addition to the work of the school, excursions are made to a number of the more important horticultural establishments for the purpose of observation.

A general examination is held at the end of each year. Those who have completed the work receive a diploma from the Minister of Agriculture. In 1894, 89 per cent. of the graduates of the school were engaged in horticultural operations. There is a wide demand for their services throughout France, and the school is believed to meet a specific want in French horticulture.

NATIONAL DAIRY SCHOOL.

The National Dairy Farm School was established in 1888. It teaches the theory and practice of butter and cheese production, is a station of information for the district on all subjects pertaining to the dairy industry, and conducts experimental investigations along dairy lines. It is intended to meet the wants of young men who expect to take up dairying as an occupation, and of all others who wish to acquaint themselves with the latest and most improved dairy practices.

The school is well equipped with all the latest machinery and apparatus necessary for the production of first-quality products. The milk used is obtained by a co-operative arrangement with neighbouring farmers. A field of about seven acres is attached to the school. Here soiling crops are grown intensively. The botanical garden contains plants which are known to affect the quality of milk. The course lasts one year, and is gratuitous. It includes dairy farming, chemistry, technology, zootechnics, book-keeping for dairy farms, the elements of general physics and chemistry, mechanics, micro-organisms, and botany. Practical work is had in the manufacture of butter and the varieties of cheese best suited to the French market.

The teaching staff consists of a director, professor of technology and chemistry, veterinary surgeon, professor of zootechnics, two experts in cheese manufacture, and a milk inspector. Candidates for admission to the school must be between 17 and 30 years old. Those holding the diploma of a primary school, farm school, or of a practical agricultural school are admitted without entrance examination. Others are examined in mathematics and the history and geography of France and her colonies. Pupils room and board themselves. There are a number of scholarships for deserving students, which are obtained by competitive examination.

The school is especially valuable to the district in which it is located. It gives practical advice on all matters pertaining to dairy interests, and conducts experimental work in feeding milch cows, to

given in the French language in arithmetic, surveying, levelling, farm bookkeeping, and the more general principles of agriculture, horticulture, and arboriculture.

These schools were first established by private initiative, and up to 1845 nine had come into existence. At this time the Government became interested in them, and a law was passed organising them all on a uniform basis. State aid was given for defraying the expenses of the teaching *personnel* and for boarding the apprentices, but leaving to the director or proprietor of the estate on which the school was located, the care and responsibility of the direction of the school and the expenses and profits of running it. The state requires the farm on which the school is conducted to be a model for the surrounding neighbourhood. Each year a programme of work must be submitted for the approval of the administration. The schools are inspected by the district inspectors of agriculture, and are reported upon by them to the Minister of Agriculture regarding their control.

The teaching force of these schools, besides the director, generally consists of a superintendent, who teaches the apprentices the use of tools and farm machinery and directs the field operations and the indoor work of the barn and stables; a bookkeeper, who teaches farm accounts and takes such elementary classes as may be necessary; a gardener, to direct the operations of the vegetable garden and orchard; and a veterinarian, to give instruction on the hygiene and characteristics of animals, and discuss the more simple operations of first aid to be given them in time of need. This force is sometimes supplemented by specialists, as a chief irrigator, viticulturist, dairyman, etc.

The period of apprenticeship at these schools varies from two to three years. Pupils are admitted when 16 years old, and the average number in a school is about twenty. Those who do not hold a certificate from the primary schools are examined in the elementary branches and must pass a physical examination. Upon the satisfactory completion of the course, a diploma is given and a bonus of £12. Those who do not obtain a diploma receive a bonus of £7 10s.

Supplementary to the farm schools are a number of other schools of a like grade. These include two sheep-farm schools, one silk school, fourteen cheese-making schools, one school of fish culture, and two primary agricultural schools.

At one period these farm schools were very popular in France. Up to 1850 some seventy had been established. From that time on the number gradually decreased until the present time, when there remain but fourteen. Many of the original schools have been converted into the practical schools of agriculture, previously noted. Others declined because the peasantry were unwilling to part with the aid of their children for two or three years when they might learn about the same thing, and at the same time earn from £10 to £15 per year on a well-managed estate. At the present time most of

the farm schools are in the South of France, where agriculture is least advanced, and the work at most of them closely approximates the work offered in the practical schools.

AGRICULTURE IN THE PUBLIC SCHOOLS.

The schools thus far described are given up entirely to agricultural teaching. There remains for discussion the public-school system, in which agriculture is but one branch of the general course. Agricultural instruction is given in all French normal schools for men, and by the laws of 1879, 1887, and 1888 it has been made obligatory to teach in the rural elementary schools the elements of the natural and physical sciences, with their application to agriculture. According to the French programme of 1887, which is translated in full in the Report of the U.S. Commissioner of Education for 1895-96, agricultural instruction in the primary schools is as follows:—

ELEMENTARY PRIMARY INSTRUCTION.—*Elementary course (pupils 7 to 9 years old)*: First lessons in the garden and school. *Middle course (pupils 9 to 11 years old)*: Ideas appropriate to what the child has read; object lessons and excursions for the purpose of familiarising pupils with soils, fertilisers, tillage, and common implements. *Higher course (pupils 11 to 13 years old)*: More methodical instruction on tillage, implements, drainage, fertilisers of all kinds, sowing, harvesting, domestic animals, and bookkeeping; ideas about horticultural propagation, tree culture, and grafting.

SUPERIOR PRIMARY INSTRUCTION.—*Advanced course for boys and girls over 13 years old*: Practical ideas about vegetation, the duration of growth, and reproduction (by seeds, buds, grafts); different kinds of lands, manures and their use, and rotation; the use of agricultural implements and machines; principal operations in agriculture, such as breaking up land, planting, transplanting, drainage, and irrigation; principal crops of France and of the locality; diseases of plants, parasites; legumes, fruits, flowers; use of sash; training and pruning fruit trees; care of domestic animals; bee culture.

About 3,400 of the rural primary schools have gardens attached to them. There are 160 superior primary schools, in which more than 15,000 pupils receive instruction in agriculture.

Official circulars have been issued by the Ministry of Agriculture suggesting the ideas and purposes involved in the agricultural instruction to be given. These direct that the instruction shall be addressed less to the memory than to the intelligence of the child. It should be based on the observations of facts in country life and on simple experiments with familiar objects, and designed to prove the scientific fundamental ideas of the most important agricultural operations. The children should learn above all things else the reasons for the operations rather than the manner of performing them. Still less should they be compelled to learn a list of definitions, precepts, or agricultural recipes.

The aim of the elementary instruction is to give the greatest number of country children that degree of elementary knowledge which is essential to enable them to read a modern book on agriculture or attend an agricultural meeting with profit; to inspire them with a love of country life, so that they may prefer it to that of towns and factories; and to inculcate the truth that agriculture, besides being the most independent of all occupations, is also more remunerative than many others for industrious, intelligent, and well-instructed farmers.

It was difficult in the beginning and the difficulty has lasted well up to the present time to initiate the teachers into the spirit of the new teaching in the primary schools. Books on agriculture were placed in the hands of the pupils; agricultural rules, even though sometimes debatable, were taught as axiomatic truths; the memory rather than the understanding was consulted, and the learning of words rather than the observation of facts was made the basis of agricultural teaching.

In order to supply teachers with an adequate knowledge of the principles of agriculture, a course of agriculture was established in all the normal schools for men. It was not intended that the normal schools should be turned into agronomic institutes, but that agriculture should be given an honourable place in the school curriculum. It was desired to give the graduates of such schools an exact knowledge of the soil, the means of improving it, the methods of cultivation, and the general management of farms, gardens, and stables. According to the Minister of Education, it is sufficient if teachers in the elementary schools teach simply the elements of agriculture, give wise counsel in the neighbourhood, and, if necessary, combat effectually routine and prejudice. To accomplish this, the instruction given by the teacher should be accurate and clear. The ideas of the pupils should be rectified by visits to the best farms, by some laboratory work, and by frequent tests in the garden or demonstration field of the school. The object of the course in the normal schools is not to teach the business of farming, but to study the phenomena of life and the condition of its development, to inspire a love for the country, and to develop the natural tendencies of children to become interested in flowers, birds, etc.

In the normal-school programme for teachers two hours a week are devoted to agriculture, zootechny, and rural economy in the second year of the course, as follow:—(1) *Vegetable growing*—study of the soil; the means of modifying its chemical composition and physical properties by fertilisers; irrigation; drainage; cultivation; rotation of crops, and special crops, such as cereals, legumes, etc. (2) *Zootechny*—feeding of horses, cows, sheep, and swine. (3) *Rural economy*—property in land; methods of exploitation and capital required; book-keeping. In the third year of the normal course one hour a week is devoted to fruit-tree and vegetable growing, as follows:—General idea of culture; planting and preparing the soil; work in the orchard and garden. It is expected that the

professors will emphasise the methods and products of the localities in which the schools are located.

DEPARTMENTAL AND SPECIAL PROFESSORS.

Thus far there have been described simply the schools in which the youth of France receive instruction in agriculture—the National Agronomic Institute, the national schools, the practical schools, the farm schools, the rural primary schools, and the public normal schools for men. There still remain the farmers themselves, who need instruction, and besides the whole system of agricultural instruction needs to be bound together and unified. For the purpose of general supervision there are, as already mentioned, the three inspectors-general and the eight district inspectors. There are also the departmental and special professors. A department in France may be compared in a general way to a county in the United States. In 1894, ninety of the departments of France had been supplied with departmental professors of agriculture, as authorised by the law of 1879. There were also 114 special professors. The respective functions of these two officers are as follow :—

The departmental professor is charged (1) with giving a two years' course in agriculture in the public normal schools (*see* page 127), thus grounding the future teachers in the rural primary schools in the principles of agriculture, and (2) with holding at least 26 institutes a year. The object of these institutes is to teach the farmers of the district facts regarding seeds and varieties, the use of commercial fertilisers, treatment of vines, replanting vineyards, and the means of combating drought, excessive moisture, insect ravages, etc. He lectures always on subjects of most interest to the local agriculturist, and is under the direct control of the department of agriculture, though paid in part by the department of education.

The special professor gives (1) a course of agriculture to the pupils in the last two years of the superior primary schools, and (2) short courses to adults in some of the rural wards. The course for adults given by the special professor differs from that given by the departmental professor in that "the province of the first is to inform; that of the second, to teach." The special professor gives short courses of from four to ten days' duration, according to the needs in different localities. It is intended that this work shall supplement the information acquired in the superior primary schools and in schools of practical agriculture, to refresh the memory of older students of agricultural schools, bringing up to date the latest agricultural information, and to prepare the farmers to follow with profit the instruction of the departmental professor.

These annual reviews of agricultural progress are believed to be of much practical benefit to rural interests. The lack of experience sometimes found in young professors is commented on unfavourably, but on the whole the agricultural teaching of the departmental and

special professors is in good favour. During the year 1893 more than 300,000 farmers and teachers were in attendance at the departmental institutes.

The departmental professor has still another *rôle* in agricultural teaching. Not only does the French Government require that farmers be taught the theory of agriculture by word of mouth, but they must also be taught the fact by ocular demonstration. For this purpose, small fields of demonstration have been created, where the good effects of fertilisers or tillage operations, varieties, etc., may witness to the locality the truth of the theories presented in the institutes and conferences. These fields of demonstration are under the direct control of the departmental professors. They are popular with the people, and are ranked among the most powerful factors for increasing French agricultural productions. In 1894, 3,362 of these fields of demonstration had been created in the different departments of France.

EXPERIMENT STATIONS AND LABORATORIES.

In addition to the fields of demonstration already noted, there were in 1894 seventy-seven establishments in France for agricultural analysis and research. These also render much service to the agricultural population. In the laboratories fertilizers, food stuffs, soils, seeds, waters, etc., are analysed, and in the stations original investigations in agricultural problems are undertaken. These experiment stations are usually smaller institutions than our own, and in comparison are relatively weak in working force, equipment, and resources. They are, however, of very great use to the localities in which they are located.

SUMMARY.

To sum up, the various factors which enter into the agricultural educational system of France are:

(1.) The rural primary schools, in which are taught the elements of the natural and physical sciences as related to agriculture. The aim in these schools is to create in the pupils a love of nature and to give them a knowledge of the simplest facts in agriculture. They reach the masses. As a preliminary, there is involved the systematic training of teachers in the departmental normal schools for this work.

(2.) The maintaining in each department and nearly every commune of trained agriculturists, who conduct successive short courses in agriculture especially adapted to the needs of the community at the time, manage fields of demonstration in the locality, thus manifesting to the eye the truth of the theories presented and the value of scientific methods in agriculture, and act as a bureau of agricultural information for the community at all times. They teach the farmers themselves. The experiment stations and laboratories, widely distributed throughout France, serve much the same purpose as these trained agriculturists, and undertake some original investigations pertinent to the locality.

(3.) The semi-private farm and practical schools for the training of sons of farm labourers, peasant proprietors, and the small-farmer class in the best farm practices, and grounding them in the basic principles of scientific agriculture. They train the men who are to do the actual work on the farm.

(4.) The national schools, giving a higher grade of instruction in agriculture, horticulture, forestry, veterinary science, and the technical agricultural industries to sons of the large landed proprietors and to the more apt pupils of the lower schools. They train the teachers and leaders in agricultural progress and furnish managers of agricultural industries.

(5.) The National Agronomic Institute at Paris, serving as a kind of post-graduate school in agriculture of a university type, and commanding the services of a corps of the ablest scientific men in France. Here the latest facts in scientific agriculture in France and elsewhere are accumulated and published, and original research work in agriculture is undertaken. It trains teachers and leaders capable of raising and maintaining the agriculture of the country on a high level, of serving in governmental positions, or of moulding the agricultural policy of the State.

Summarising, then, for the whole country, it will be seen that, besides obligatory teaching in all rural primary schools, France has in all, 12 institutions for teaching agriculture of the first and second degrees, 43 for teaching the third degree, 34 for pure practice of apprenticeship, 3,362 fields of demonstration, 77 establishments for analysis and agricultural research, and 214 departmental and special professors of agriculture, who give instruction yearly to 300,000 adult farmers and conduct agricultural classes in the normal schools for men and in the rural primary schools.

PRODUCERS' CONFERENCE

With reference to the resolution passed at the last annual meeting of producers: "That in the opinion of this Conference the Agricultural Bank Act should be so amended as to bring it into conformity with the Credit Foncier system." A reply has been sent by the Secretary of the Department of Agriculture to the mover of the resolution, as follows:—"With further reference to the resolution brought forward by your Society at the last Conference, with reference to the above subject, I beg to inform you that the Manager of the Agricultural Bank has obtained the required information, and is in accord with the desire of the Conference to enlarge the scope of the Bank. The Minister has given the matter his consideration, and has decided that it will not be possible to introduce an Amending Act this session; but the matter has his sympathy, and will not be lost sight of."

INSECT PESTS ACT.

MONTHLY REPORT.

The Inspectors under the above Act have visited a large number of orchards and gardens during the past month in the Perth, Swan, Kelmiscott, Collic, Mt. Barker, and Kojonup districts. The reports of these inspections show the orchards examined to be in a fairly healthy condition. Twenty-two orchards, in which San José scale was formerly found to exist on 94 trees, were carefully examined, and in only one of these was the scale found. In this case it is worthy of mention that the owner preferred to use his own methods in preference to those prescribed by the officers of the Department, with the result that instead of having eradicated the pest, half of the trees affected are still found to harbour the disease. A careful examination of all orchards and gardens in Perth has been commenced, and the destruction of diseased and worthless trees found growing in the city is being enforced.

All fruit passing through the auction rooms and marts is subjected to a close inspection, and occasional visits are paid to fruit shops in the city and suburbs.

The presence of a fruit maggot infesting cocoanuts has lately been discovered, and a number of diseased nuts have been seized and destroyed. Anyone who happens to get hold of cocoanuts containing maggots should consign the same to the flames at once, and see that they are completely destroyed, as the fly may otherwise breed out and acquire a taste for such fruits as are grown locally.

G. BUCHANAN,

Acting Chief Inspector.

9th December, 1901.

BACK NUMBER OF JOURNAL REQUIRED.

Any person having a copy or copies of the January issue of this year, 1901, of the *Journal*, will oblige by sending same in to the Editor, Department of Agriculture, Perth: Sixpence will be paid for each copy.

WATERLOO AND SURROUNDING DISTRICT.

Visit by the H. and V. Expert—MR. A. DESPEISSIS.

At the request of the Waterloo Farmers and Fruitgrowers' Association, I made last week a tour of inspection to the orchards and vineyards of the Waterloo Plains, near Bumbury, and also on the Collic River.

Although the season is very young yet, there is evidence that the fruit crop in that locality will be a good one. The fruit is setting freely on vines and trees, and blights, as well as orchard pests, have not so far proved troublesome.

The amount of success which has attended the efforts of settlers in the locality referred to far exceeds that which the uninviting appearance of the country in its unreclaimed state portended. The oldest orchards of the neighbourhood, Mr. Hynes's and the Messrs. Craggie's, were established some twelve years ago, before the days when railway communication linked together the settlements between Perth and Bumbury. Some errors of judgment were in those days made in the selection of trees; but those have since been rectified by grafting. A dozen new settlers or so have since, encouraged by the results shown by the older planted trees, broken up land, drained and cultivated it, and have now established promising orchards and vineyards.

A small colony of Italian vinegrowers have now amongst them some thirty acres of wine grapes in good bearing. The wine made is of a light, dry character, and when produced by the choicer grapes shows character and quality. Some wine especially, made of the Dolcetto grape, I noticed more particularly. This grape, which is much grown in the Piedmont provinces of Italy, seems exceedingly well adapted to our local natural conditions, especially for the wet plains of the South-west districts, as it fears drought more than damp soil. It requires long pruning, ripens its crop early, and produces a wine light in colour, in alcoholic strength, and clean and pleasant to the palate. For blending with our heavier wines it should prove of great value.

Clearing is light on the Waterloo Plains, the land is of a loamy character, overlying a stiffer yellow sub-soil, and is easy to work; a year or two after clearing, natural grasses of rank growth take possession of the land in the winter months, when the land is too sodden to support teams and implements. Deep drainage and breakwinds are essential requisites to successful fruit growing. Bamboo reeds, togasaste, the osier willow, the myrobolan, or cherry plum, would be amongst the most suitable plants for the purpose of breakwinds. Amongst fruit trees, apples and pears thrive best of all, and plums also do well. The extensive cultivation of the

passion fruit should prove a remunerative one, but the growers should guard against obtaining their seeds from fruit grown in the neighbourhood of Sydney, where a disease, characterised by a thickening of the rind of the fruit and a generally "woody" appearance, is causing much trouble.

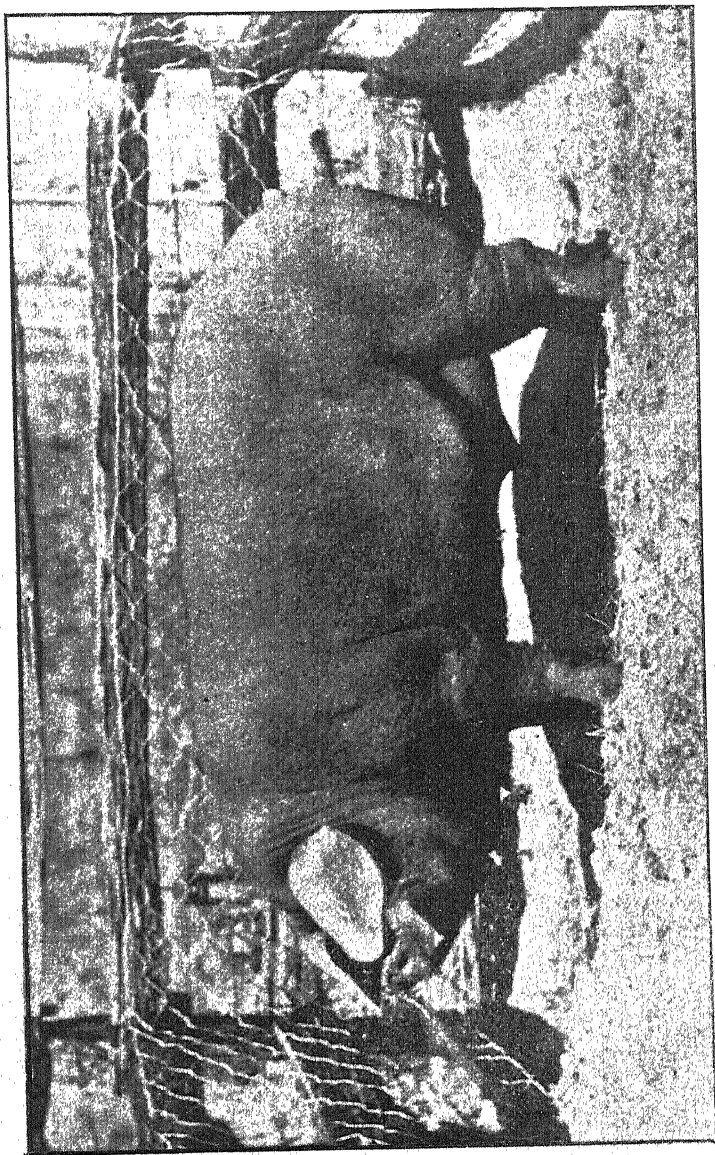
All through the orchards visited, vines and fruit trees alike, are setting their fruit crop, which promises to be an abundant one.

Few pests have hitherto proved troublesome this season. Predaceous, as well as parasitic insects are busily at work checking aphides and scales. Larvæ of the *Syrphus* fly can be seen everywhere feeding on pear and peach aphids.

At Mr. E. M. Clarke's orchard, at Roelands, I noticed the sweeping work of lady-birds in cleaning the citrus trees of black and of soft brown scales, and amongst others *Orcus Australasia*, one of the best of our native scale-eating species, but which, unfortunately, is heavily parasitised. *Chilomenes quadripustulatus*, which, besides aphides, attacks the young of scale insects, but is seldom seen eating the matured scales; and *Leis Conformis*, the introduction of which in Western Australia we owe to Mr. A. M. Lea, who sent large colonies to the Department from Tasmania. This insect, which feeds indifferently upon aphides and the young of scale insects, bids fair to establish itself strongly in this State, owing to the fact that it will meet with abundance of food, and that care having been taken to only liberate healthy adult insects, it will find here a home free from those parasites which attack it in other parts of Australia. I also noticed in that same orchard numerous specimens of *Coccinella transversalis*, which feeds almost solely upon aphides.

LARGE BLACK ESSEX PIGS.

The Secretary of the Department of Agriculture has received a letter from Messrs. Elder, Smith, and Company, of Adelaide, offering some excellent Holstein bulls and large black Essex pigs for sale. In their letter they say:—"Enclosed, we hand you photograph of the imported boar, 'Australia,' which measured 6ft. 4in. in length, and stood 3ft. high at 18 months old." We reproduce the photo. referred to, and the Secretary will be pleased to receive any inquiries about these animals.



"AUSTRALIA,"
Imported Large Black Essex (see page 422).

INSECT PESTS AMENDMENT ACT, 1898.

CIRCULAR LETTER TO FRUIT GROWERS.

DANGER OF SECOND-HAND CASES.

The following circular is being sent out by the Secretary of the Department of Agriculture to all fruit growers within the State, to endeavour to secure their co-operation in abandoning the dangerous practice of using second-hand cases without taking proper precautions to ensure their disinfection.

[CIRCULAR.]

"I beg to draw your attention to the following Regulation under 'The Insect Pests Amendment Act, 1898':

Regulation 20.

"The use within the State of second-hand fruit case, or cases or packages that may reasonably be supposed to have contained fruit, is prohibited, and the Chief Inspector or Local Inspector may order the disinfection of same as provided in Order 11, or by any other means that may be directed by the Secretary of the Department of Agriculture, and failing such disinfection, may seize and destroy same.

"Regulation 11 prescribes that cases and packages may be disinfected by dipping and keeping continually submerged for a period of not less than five minutes in boiling water, containing in solution not less than one pound (1lb.) of concentrated potash to every ten (10) gallons of water.

"I would point out the great danger that exists of introducing and spreading diseases by means of fruit cases that may have contained or come in contact with diseased fruit, and would urge you, in your own interests and for the benefit of the fruit-growing industry generally, to do your utmost to discountenance the use of second-hand cases, either by refusing to allow cases that have contained fruit to come on your premises, or by insisting on the proper disinfection of the same as prescribed by the Regulations."

NOTICE TO SUBSCRIBERS.

Subscriptions for the year 1902 are now due, and must be paid on or before 1st February, 1902, otherwise names will be struck off the lists.

GARDEN NOTES FOR DECEMBER.

PERCY G. WICKEN.

The green appearance is now fast leaving the country districts, and its place is being taken by a brown, dried-up look. Those who have growing crops should keep the hoe going as much as possible between the rows: this will destroy the capillary action of the surface soil and prevent a too rapid evaporation of the moisture, and also keep the soil in a condition to absorb any moisture which may fall. Weeds are comparatively easy to deal with at this time of the year, as when once cut down they soon perish; care should be taken that no weeds are allowed to seed. There are plenty of patches of swampy and wet land that will grow nothing all the winter which may be made to carry a crop of vegetables during the next few months, and full advantage should be taken of these patches. Those who are lucky enough to have means of irrigating their land should bear in mind that one good soaking is much better than two or three slight waterings, a light watering only encourages surface roots to grow, which are unable to stand any lengthy period of drought. Any seed beds sown this month will require to be well watered and shaded from the sun, and any young plants transplanted into the field will require to be shaded; strips of bark or old shingles are very useful for this purpose. In the orchard attention must be paid to insect pests; the black aphid is very bad in some parts. The remedies to be used for this pest are whale-oil soap, resin and soda wash, or a wash made of tobacco refuse is very effective.

FRENCH BEANS should now in most districts be in full bearing, and large supplies are available in the market. The butter bean, a variety of French bean that are of yellow colour and stringless, deserves to be much more largely cultivated than it is; it is prolific and an agreeable change from the common variety. The scarlet runner and other climbing varieties will require staking, and this should not be neglected. If the green pods are kept constantly picked, the plants will keep bearing for a long period.

MADAGASCAR BEAN.—Sometimes called the poor man's bean. These are great climbers, and are ornamental as well as useful. The whole pod of this plant is eaten the same as the French bean.

LIMA BEAN.—Either running or dwarf varieties may still be sown if the ground is fairly moist. They deserve more attention on the part of gardeners than they are in the habit of receiving.

CABBAGES.—The aphid are very troublesome on most crops at the present; the tobacco wash is the best to use for aphid, and for grubs which are eating the leaves apply a spray of Paris green; 1lb. to 160 gallons is the standard strength. Towards the end of the month seed-beds may be made to raise plants for future use.

CUCUMBERS.—If the ground is moist plant out a few more hills, but the ground must be deeply worked to retain the moisture. The apple-shaped cucumber is a good variety to grow, and is a change from the long variety.

CELERY. If plenty of water can be obtained sow a further supply of seed, but they require plenty of moisture; plants already growing should be well hilled up.

MAIZE. A further supply of this plant for a vegetable may be sown, a mistake is often made in sowing the wrong varieties for table purposes. Stowell's evergreen and Henderson's sweet maize are two good varieties; the ordinary maize is not of much use as a vegetable.

MELONS.—**ROCK, WATER AND PRESERVING.**—The early varieties of rock melons should now be ready for market; water and preserving melons will require working between the rows.

PUMPKINS AND SQUASHES.—The early varieties of squashes and marrows will now be ready for cutting; seeds of some of the later varieties can still be sown.

SWEET POTATOES.—A few more cuttings may be planted out to replace those missed, but will require to be shaded from the sun.

TOMATOES.—A few tomatoes are now coming into market, but are of very inferior quality. Growers would do well to plant better varieties. The rough wrinkly tomatoes are not good varieties. The smooth skin varieties such as Ponderosa, Dwarf Champion, Optimus, and others are much better market varieties, and just as easy to grow.

TURNIPS.—Early varieties may be planted at the end of the month.

FARM NOTES.—Harvesting operations will now be in full swing, and the days all too short for the work to be done. The wheat should be cut or stripped as soon as it is ripe, as if left too long some varieties, especially the Steinwedel, shell their grain very freely, and a large proportion of the crop is lost. There is also a daily risk of fire at this time of the year, and the sooner the crops are harvested the better for the settler. When building stacks of wheat or hay, care should be taken to plough a strip of land all round the stack; this will act as a fire break, and may save the stack from being burnt. Maize and Sorghum for green feed can still be sown where the ground is moist enough, and cow peas can still be sown for seed and green manuring; they will be a great advantage to the following wheat crop. A National Show is again being held in Perth next March, and all growers should keep back exhibits to help their districts make a good display at that time.

MARKET REPORT.

FOR MONTH ENDING DECEMBER 9, 1901.

The W.A. General Produce Company report sales effected for the month ending December 9:—

Sales during the past month have been equal to all expectations. Farm supplies of local origin very much on the increase, likewise dairy lines are gradually moving ahead; still there is a vast scope for dairy goods, and practically all cash lines. Farmers ought to take advantage of the good chances our market offers to them to go in more for mixed farming, and thus stop some of the money which goes out of this State every week for butter, cheese, bacon, eggs, poultry, etc. Fruit, local, as is usual this time of the year, the supply is confined to one or two sorts and very much limited. Hence, to make up the variety, foreign markets have to be tapped. Our principal supplies are now from South Australia and Italy, and, to a lesser degree, Victoria and New South Wales. Vegetables, especially cabbages, have been quite a drag on the market of late, early summer sorts being very plentiful and selling at fair prices. Salads are daily on the increase, and some very fine specimens of cress are in just now. Poultry has not been sufficient for the demand, and all those which came forward sold well; excellent demand still on, and we advise senders not to delay, but feed the market.

Farm and Dairy Produce.—Bacon sides of sound quality selling well, stocks rather light. Hams, the demand daily increasing, supplies very short. Butter, values are inclined to firm, quality very good of late, giving satisfaction. Lard, very little on spot, selling at high rates. Cheese, a great run on mild lots during the week, stocks very short indeed. Eggs, local, are again becoming scarce, and those from reliable senders selling well. Onions, much easier in values, arriving in fairly good order. Chaff, just now good sample rather in demand. Bran and pollard, both lines heavy sales, inclined to firm. Flour, slightly higher f.o.b. Adelaide. Oats, few more sources quoting, and it is believed values likely to decline. Maize, few good inquiries for seed lots. Wheat, new crop to arrive in a few days, price to begin the season will likely be about 6d. higher than last. Oil cake, consignment of Singapore just arrived and selling splendidly.

Fruit.—Oranges, practically only Italians offering, which are rather sour as yet. Lemons, very good supplies of imported, and few local, selling well. Cherries, some very fine samples from Adelaide, selling moderately well. Bananas fairly scarce, as it is rather hot to insure them arriving sound. Cape gooseberries, fairly good supply forward, realising very satisfactory prices. Strawberries, supplies shrinking, and slightly higher values obtained this week. Cherry plums, from Adelaide, few cases in fairly good condition. Gooseberries, green, arriving in splendid order and selling well.

Vegetables.—Cabbage almost unsaleable. Carrots and parsnips, usual supply and demand. Turnips, usual supply and demand. Beans, French, selling fairly well if fresh. Peas are getting rather dry, and hard to dispose of in consequence. Marrows and pumpkins have already started, and so far selling to very good advantage if matured. Rhubarb, supplies very good, values normal.

Salads and Herbs.—Lettuce, some nice lots came forward and sold to good advantage. Spring onions, hard to dispose. Beetroot, some really fine lots arriving and selling very well indeed. Cucumbers arriving fairly plentiful, and some exceptionally good in quality. Tomatoes, increased supply every day, and so far of very good quality. Celery, very little

marketable quality offering. Thyme, marjorum, sage, very good outlet if sun-dried leaf is sent to market.

Poultry. Fowls: All those fit to kill sold at very good values. Chickens selling at exceptionally high rates, good demand continues. Ducks selling very well indeed. Duckling fit to kill, good outlet. Geese and goslings, all those forward sold splendidly. Turkeys, very scarce and good birds wanted, command high prices. Pigeons, have large outlet for good birds in condition.

Carcase Meat.—Weather too hot to venture consignments.

Sundries.—Bonedust, phosphate, guano, values unchanged, supplies fairly good. Coarse bacon salt, selling very well. Corn sacks and bran bags, orders still keep coming in for both new and second-hand.

STUD PIGS.

Attention is called to the fact that the Department has still a few young Tamworth boars, from imported stock, for disposal. Early application should be made to the Secretary, Department of Agriculture, for the same. Price, £3 3s. each on rail at Perth.

SECOND

NATIONAL SHOW OF PRODUCE.

IN order to show the great progress made in Agriculture during recent years, it has been decided by the Hon. Minister for Lands to again hold a National Show in Perth next March. Prizes are to be given for the best collection of farm produce exhibited by groups of Agricultural Societies, and also for the best exhibits of manufactured articles made from locally grown products.

1. CHAMPION PRIZE.

(DISTRICT EXHIBIT.)

Best collection of Farm, Garden, and Orchard produce, comprising everything grown, produced, and made on a farm. First prize, £40; second prize, £20; third prize, £10.

The exhibit to be collected by the Agricultural Societies from produce grown within the boundaries of their respective districts, as defined on pages 433 to 435, and to be displayed by them. Should they be called upon to do so by the Judges, the Secretaries of the Societies, or the person placed in charge of the exhibits, shall make a declaration that all the exhibits have been grown or produced within their respective districts.

In order to encourage individuals to contribute to the district collection, first, second, and third class certificates of merit will be issued by the Department for the best exhibits in each class. For this purpose the exhibits in the district collections may be labelled with the name (or number) of the grower.

The certificates will be given for the best exhibits in each class, irrespective of the district, such as the best pumpkins, best sample of wheat, etc., and need not necessarily be contained in the best district collection.

The prize money will be paid by the Department to whomsoever the Societies nominate to receive it, but this nomination must be sent to the Secretary, with the detailed entries, not later than 1st February.

The medals and certificates will be distributed per medium of the Agricultural Societies.

MANUFACTURED GOODS.

EDIBLE.

Class 2. Best exhibit of—

- A. Jams and Preserves.
- B. Sauces and Pickles.
- C. Flour.
- D. Wine.
- E. Honey and Bee Products.
- F. Butter.
- G. Bacon.
- H. Miscellaneous.

First prize, silver medal; second and third class certificates.

NON-EDIBLE.

Class 3. Best exhibit of—

Manufactured from produce of West Australian soil (minerals excluded).

- A. Articles manufactured from local timber.
- B. Brushware.
- C. Fruit cases and shooks.
- D. Soap and Candles.
- E. Miscellaneous.

First prize, silver medal; second and third class certificates.

POULTRY APPLIANCES.

Class 4. Best collection of Poultry-keeping Appliances. First prize, certificate; second prize certificate.

BEE APPLIANCES.

Class 5. Best collection of Bee-keeping Appliances. First prize, certificate; second prize, certificate.

SPRAYING APPARATUS.

Class 6. Best collection of Spraying Apparatus. First prize certificate; second prize, certificate.

MANURES.

Class 7. Best collection of Manures, to be in stoppered bottles, to contain about 7lbs. each, with analysis attached. First prize, certificate; second prize, certificate.

CLASSES 2 AND 3.—The articles to be manufactured by the exhibitor or through the agency of the firms competing. Should they be required to do so by the Judges, the exhibitor, or in the case of a firm, the manager, shall make a declaration that all the articles have been made by himself, or his firm, from agricultural produce raised in West Australia.

BOTANICAL.

POISON PLANTS.

- Class 8. Best collection of West Australian Poison Plants. (Pressed.)
First prize, certificate; second prize, certificate.

NATIVE GRASSES.

- Class 9. Best collection of native Grasses. (Pressed.) First prize, certificate; second prize, certificate.

SALTBRUSHES.

- Class 10. Best collection of native Saltbushes. (Pressed.) First prize, certificate; second prize, certificate.

FODDER PLANTS.

- Class 11. Best collection of native Fodder Plants, not including grasses. (Pressed.) First prize, certificate; second prize, certificate.

WOOL.

- Class 12. Best three fleeces of—
A. Merino ewe's wool.
B. Merino ram's wool.
C. Merino lamb's wool.
D. Shropshire Down wool.
E. Long-wool sheep.
F. Cross-bred sheep.

The breed of the sheep, sex and age, and the number of days' growth of wool to be stated in each case. First prize, silver medal; second prize, certificate.

Railway freights from station of departure to Perth will be defrayed by the Department on all produce sent by the Agricultural Societies for competition, but no return freights will be paid on unsold exhibits. The Department will receive and store exhibits at Perth if duly notified beforehand, and will take every care, but will not accept any risk. The Secretary of the Department of Agriculture reserves the right of rejecting any exhibit not considered suitable. All exhibits must be addressed as follows. (Proper labels will be supplied free if application is made to the Secretary of the Department of Agriculture, Perth) :—

NATIONAL SHOW, 1902.

To the Manager, Government Refrigerating Works (Siding), Perth.
From—

Name in full.....
Address.....
Nature of contents to
be fully specified, giving {
name, variety, and date {
of packing if fruit or }
other perishable produce }

All table and necessary accommodation for the display of exhibits will be provided free of charge, but all exhibits must be displayed by the competitors at their own expense in the space allotted for that purpose by the Department. A limited number of free railway passes (return) will be granted to each district exhibiting, to enable representatives to attend and arrange their respective courts.

To encourage country societies to make a good exhibit of perishable produce, a certain space, if available, in the Government Refrigerating Stores will be set apart for the purpose of keeping perishable products, and on each district notifying their intention of competing, a reasonable amount of exhibits will be stored for them *free of charge*, the Secretary, Department of Agriculture, reserving the right of limiting or rejecting any exhibit which, in his opinion, may not be worth the expense of cold storage.

Societies will be allowed to exhibit a reasonable number of bags of grain, or other heavy produce, such as potatoes, roots, etc., and can collect from the farmers of their district, but will be limited to one bag from each farmer of each class of grain. The Department will not pay freight on more than one ton of flour from any one mill.

All Societies intending to exhibit must notify the Secretary, Department of Agriculture, by December 1st, as to their intention to exhibit, so as to enable arrangements to be made for a hall, and all entries in detail must be in the hands of the Secretary by February 1st, 1902.

The decision of the Judge or Judges to be final.

For the purposes of the competition for the Champion prize, the State has been divided into 15 districts, and the societies within each district should combine together and make one large exhibit. Each exhibit will be placarded Blackwood, Beverley, Northam, etc., as the case may be. A list of the Societies in each district is appended.

Efforts will be made to arrange excursion trains from the country, so that all may see the exhibition.

A sale of produce will be arranged by the Government auctioneer after the exhibition, and anyone desiring to sell their exhibits may do so by paying the auctioneer's commission. The Department will not be in any way responsible for the exhibits after the close of the exhibition, nor for the sale or collection of money for which exhibits may have been sold.

On no account must perishable produce be packed with other classes of exhibits.

The co-operation of all societies is invited so as to make a good show, and thereby to stimulate the demand for West Australian produce.

All exhibits must be forwarded so as to arrive at the Hall by 6 p.m. on the day previous to the show.

Any further particulars can be obtained on application to the Secretary, Department of Agriculture.

LIST OF EXHIBITS WHICH IT IS SUGGESTED MIGHT BE COLLECTED BY THE SOCIETIES COMPETING FOR THE CHAMPION PRIZE :—

COLLECTION OF GRAINS.—Wheat, Oats, Barley, Rye, Maize, etc.

COLLECTION OF ALL KINDS OF SEEDS :—

Beans and Peas, Cow Pea, etc., both as green feed, hay and seed.

Rock, Preserving, and Water Melons, Pumpkins, Marrows, Squashes, Cucumbers, etc.

ROOT CROPS.—Sugar Beets, Turnips, Swedes, Kohl Rabi, Mangels, Potatoes, Sweet Potatoes, Yams.

HAY AND CHAFF.—Lucerne, Wheaten, Oaten, Millet, Grass, Mixed, both bale and sheaf.

ENSILAGE.—Sweet and sour, chaffed and whole.

FODDER.—Sorghums, Millets, Lucerne, Green Maize, Teosinte, Tree Lucerne, Lupins, Cabbage, Kale, Rape, Mustard.

MISCELLANEOUS CROPS.—Buckwheat, Ramie, Jute, Broom Millet, Peanuts, Arrowroot, Indigo, Sunflower, Cassava, Tumeric, Tobacco, etc., etc.

VEGETABLES.—Cabbage, Beans, Peas, Tomatoes, Asparagus, Cauliflower, Chillies, Leeks, Parsnips, Carrots, Rhubarb, Turnips, etc.

FRUIT AND GRAPES of all kinds, both fresh, dried, and preserved.

Honey, Eggs, Butter, Cheese, Bacon, Lard.

HOME MADE Jams, Jellies, Pickles, Vinegar, Wine, Bottled Fruits, Sauces, Arrowroot, Millet Brooms, Fibre, Tobacco, Candied Peel.

LIST OF EXHIBITS WHICH IT IS SUGGESTED MIGHT BE COLLECTED BY FIRMS COMPETING FOR THE PRIZES FOR EDIBLE PRODUCTS.

Collections of Jams, Jellies, Sauces, bottled : tinned and dried Fruits, Vinegar, Candied Peel, Wines, Arrowroot, Tapioca, Butter, Cheese, Bacon, Ham, Lard, Honey, Wax, Bread, Maize Meal, Oatmeal.

LIST OF EXHIBITS WHICH IT IS SUGGESTED MIGHT BE COLLECTED BY FIRMS COMPETING FOR THE PRIZES FOR NON-EDIBLE PRODUCTS.

Collection of articles made from local Timbers, Handles for Tools, etc. ; Brooms and Brushes made from Millet and Fibres, collection of Fibres ; Gums, Resins, Tobacco, Dyes, Oils, Leather, Wool, Basil, Cotton, Soap, Candles, etc.

For the purpose of the Exhibition, Societies are divided into districts, as follows :—

BLACKWOOD.

Balingup Farmers' Association.

Lower Blackwood Farmers' and Graziers' Association.

Nelson Agricultural Society.
 Upper Blackwood Agricultural Society.
 Boyup Brook Agricultural and Vigilance Committee.

FREMANTLE.

Coogee Agricultural and Horticultural Society.
 Jandakot Agricultural Society.
 Walliabup Progress and Horticultural Society.

MURRAY.

Armada Progress Association.
 Drakesbrook Agricultural Association.
 Murray Horticultural Society.
 Murray District Farmers' and Fruitgrowers' Co-operative Association.
 Waigerup Agricultural Hall Association.
 West Coolup Agricultural Society.
 Jarrahdale District Agricultural Society.
 Kelmescott Horticultural and Agricultural Society.

PLANTAGENET.

- Albany and King's River Settlers' Association.
- Albany Agricultural and Horticultural Society.
- Albany and District Settlers' Association.
- Mt. Barker District Settlers' Association.

ESPERANCE.

Esperance Agricultural and Horticultural Society.

SUSSEX.

Newtown Farmers' Progress Association.
 Quindalup Progress Association.
 Southern Districts Agricultural Society.
 Wonnerup Progress Association.

SWAN.

Darling Range Vine and Fruitgrowers' Association.
 Wanneroo Farmers' and Gardeners' Association.

TOODYAY.

Deepdale Farmers' and Fruitgrowers' Association.
 Moora Farmers' and Progress Association.
 Newcastle Branch Bureau.
 Toodyay Agricultural Society.
 Toodyay Vine and Fruitgrowers' Association.
 Victoria Plains Farmers' Association.

NORTHAM.

Goomalling Farmers' Club
 Greenhills Farmers' Club.
 Jennapullen Agricultural Society.

Jurakine Agricultural Association.
 Northam Agricultural Society.
 Wongamine Farmers' Club.

VICTORIA.

Greenough Farmers' Club.
 Greenough Farmers' Association.
 Geraldton Agricultural and Horticultural Society.
 Irwin Agricultural Society.
 Chapman Farmers' Association.
 Upper Chapman Farmers' and Fruitgrowers' Association.

WELLINGTON.

Capel Farmers' Association.
 Brunswick Farmers' Club.
 Harvey Farmers' Club.
 Harvey Agricultural Alliance.
 Boyanup Farmers' and Progress Association.
 Cookernup Farmers' Progress Association
 Donnybrook Progress Association.
 Ferguson Farmers' Association.
 Preston Progress Association.
 Thomson's Brook Progress Association.
 Wellington Pastoral and Agricultural Society.
 Waterloo Farmers' Protection Association.

WILLIAMS.

Kojonup Agricultural and Horticultural Society.
 Wandering District Agricultural Society.
 Williams Agricultural Society.

GREAT SOUTHERN RAILWAY.

Great Southern Pastoral and Agricultural Society.
 Narrogin Agricultural Alliance.
 Wagin and Arthur District Agricultural, Horticultural, and
 Industrial Society.
 Marbellup and District Settlers' Association.

YORK.

York Agricultural Society.

BEVERLEY.

Beverley Agricultural Society.
 Pingley and Moorambine Agricultural Society.

THE CLIMATE OF WESTERN AUSTRALIA DURING NOVEMBER, 1901.

The weather in South-West districts has been on the whole very pleasant, but occasionally rather hot. In fact the 27th was one of the hottest days ever experienced for the time of year, the temperature rising higher than any other previous November record, at Kalgoorlie (104·8), Southern Cross (108·5), York (110·2), Perth Observatory (101·0), and Katanning (106·0). On the whole the mean maximum throughout the greater portion of the State has advanced 10 degrees since last month, and the heat is being somewhat severely felt inland. The hottest place was Marble Bar, where the mean maximum was 107·4, and the highest individual reading 111·8.

The coolest nights are now to be found about the neighbourhood of Katanning, where the mean minimum was 49·8, being 7 degrees below that for Perth, and 10 degrees below Coolgardie. The influence of the sea breeze in keeping down the temperature during the day time is now very marked, the following figures showing the mean maximum and the mean minimum on a line running approximately East and West:—

	Mean max.	Mean min.
Rottnest	72·4	59·3
Fremantle	72·2	58·7
Perth Observatory ...	75·9	56·6
Perth Gardens	80·0	56·8
Guildford	80·3	54·0
Northam	85·3	54·0
Southern Cross	91·3	56·8
Coolgardie	90·3	59·8

The rainfall was on the whole very slight and rather under the normal.

The Climate of Western Australia during November, 1901.

Locality.	Barometer (corrected and reduced to sea level).				Shade Temperatures.					Rainfall.					
	Mean of 9 a.m. and 3 p.m.	*Average for previous years.	Highest for Month.	Lowest for Month.	November, 1901.										
					Mean Max.	Mean Min.	Mean of Month.	November, 1901.							
								Highest: Max.	Lowest: Min.						
NORTH-WEST AND NORTH COAST:															
Wyndham	29-865	29-823	30-024	29-729	98-0	80-6	89-3	104-8	69-2	101-3	80-3	113-5	70-0	432	1807
Derby	29-868	29-830	29-984	29-744	98-5	75-6	87-0	105-0	69-8	98-2	77-2	111-0	68-0	91	1157
Broome	29-876	29-857	29-979	29-763	93-7	76-4	85-0	102-2	68-5	93-4	75-4	111-0	65-0	Nil	3205
Condon	29-877	29-849	29-979	29-744	96-1	71-5	83-8	106-5	63-8	97-2	69-8	112-8	59-0	Nil	2445
Cossack	29-860	29-854	30-006	...	95-9	74-4	85-2	109-5	69-0	95-3	72-5	111-7	61-0	3	803
Onslow	29-868	29-915	30-044	29-753	97-2	68-2	82-7	109-8	61-8	93-9	63-5	118-0	49-0	Nil	250
Carnarvon	29-976	29-926	30-110	29-817	82-3	67-6	75-0	109-0	59-0	84-0	64-2	112-0	50-0	Nil	583
Hamelin Pool...	29-968	...	30-115	29-847	92-0	60-5	76-2	105-6	52-0	90-5	59-9	109-0	46-6	Nil	457
Geraldton	30-034	29-999	30-159	29-877	76-9	58-5	67-7	94-0	48-9	77-9	58-7	105-0	45-0	4	1848
INLAND:															
Hall's Creek	29-869	...	29-993	29-744	101-0	75-6	88-3	106-0	59-8	...	...	...	...	105	1651
Marble Bar	...	...	...	...	107-4	76-5	92-0	111-8	71-2	...	...	...	...	163	2046
Nullagine	29-834	...	30-014	29-693	104-0	72-7	88-4	109-0	65-0	...	...	...	...	107	1931
Peak Hill	29-872	...	30-048	29-712	96-1	70-4	83-2	105-0	61-2	...	...	...	...	23	747
Wiluna	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cue	29-932	29-890	30-109	29-727	95-9	63-7	79-8	107-3	57-0	93-4	62-5	108-2	48-9	23	472
Yalgoo	29-910	29-915	30-052	29-680	90-0	60-0	75-0	106-0	51-5	91-2	59-6	107-7	47-3	9	440
Lawlers	29-910	...	30-173	29-684	94-9	66-5	80-7	103-3	54-0	...	...	...	...	89	759
Laverton	29-916	...	30-231	29-674	91-3	66-0	80-2	102-5	57-0	...	...	...	...	4	704
Menzies	29-943	29-909	30-253	29-671	91-8	64-3	78-0	104-0	58-0	89-0	60-5	105-0	47-0	3	695
Kalgoorlie	29-964	29-935	30-286	29-688	90-7	61-1	75-9	104-8	53-0	86-9	57-9	103-2	47-2	15	781
Coolgardie	29-942	...	30-367	29-644	90-3	59-8	75-0	104-2	53-1	86-9	57-1	105-0	47-3	33	696
Southern Cross	29-960	29-934	30-191	29-716	84-4	56-8	74-0	108-5	50-1	87-9	54-6	106-0	42-0	12	735
Walebing	...	...	...	...	84-4	54-0	69-2	108-8	41-4	...	...	...	...	35	1616
Northam	...	...	...	...	85-3	54-0	69-6	109-1	45-5	...	...	...	...	17	1163
York	30-004	29-987	30-217	29-772	85-0	52-3	68-6	110-2	44-0	81-8	56-1	105-0	37-0	9	1286
Guildford	...	...	...	...	80-3	54-0	67-1	106-2	42-8	...	...	...	...	46	2867

* The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

The Climate of Western Australia during November, 1901—continued.

Barometer (corrected and reduced to sea level.)					Shade Temperatures.					Rainfall.					
Locality.	November, 1901.				* Average for previous Years.					Points (100 to inch) since Jan. 1. Month.					
	Mean of 9 a.m. and 3 p.m.	*Average for previous years.	Highest for Month.	Lowest for Month.	Mean of Month.			Highest ever recorded.	Lowest ever recorded.						
					Mean Max.	Mean Min.	Mean of Month.								
SOUTH-WEST AND SOUTH COAST.															
Perth Gardens	30-046	30-024	30-205	29-845	80-0	56-8	68-4	102-1	51-0	79-3	57-0	105-0	41-0	44	3526
Perth Observatory	30-049	30-030	30-215	29-845	75-9	56-6	66-2	101-0	49-8	73-6	55-7	93-5	45-7	49	3623
Fremantle	30-044	30-011	30-206	29-789	72-2	58-7	65-4	89-5	52-0	74-1	57-4	100-0	44-0	41	2764
Rottnest	30-037	29-975	30-198	29-820	72-4	59-3	65-8	89-6	52-0	73-5	56-4	92-5	42-0	59	2502
Mandurah	...	...	...	...	75-9	53-5	64-7	94-2	44-5	...	...	...	...	104	3087
Wandering	...	...	...	...	82-8	44-9	63-8	105-0	36-0	...	...	...	...	44	1696
Collie ...	...	...	...	...	76-6	43-1	62-4	99-8	39-9	...	...	...	...	135	2998
Dardanup	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bunbury	30-050	30-034	30-154	29-729	73-8	53-7	63-8	92-5	45-7	73-6	54-0	96-0	39-0	168	3300
Busselton	...	...	...	...	73-9	51-4	62-6	92-5	44-5	...	...	...	...	213	2997
Bridgetown	...	...	...	...	76-0	46-7	61-4	98-0	38-9	...	...	...	...	132	2866
Karridale	30-028	30-031	30-269	29-667	70-8	53-3	62-0	88-5	46-5	69-5	52-1	89-2	38-0	196	4448
Cape Leeuwin	30-014	29-999	30-282	29-393	68-6	59-3	64-0	73-2	53-8	67-5	57-4	84-0	49-0	139	3356
Katanning	30-004	29-982	30-257	29-759	80-4	49-8	65-1	106-0	41-0	78-8	49-1	97-0	36-0	45	1586
Albany	30-034	30-056	30-324	29-606	70-7	52-1	61-4	78-9	45-9	66-9	54-3	93-0	40-6	50	2383
Breaksea	30-023	...	30-338	29-232	68-1	56-0	62-0	74-0	50-0	64-8	54-5	83-8	43-2	43	1914
Esperance	30-022	30-037	30-333	29-618	76-1	55-8	66-0	105-0	42-8	72-9	54-6	112-0	39-2	1	2341
Balladonia	...	...	...	...	86-9	54-1	70-5	105-2	43-1	...	...	...	...	37	734
Eyre ...	30-004	...	30-307	29-604	78-2	55-6	66-9	104-2	42-7	...	...	...	...	47	1180

* The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

The Observatory,

4th December, 1901.

W. E. COOKE,
Government Astronomer.

RAINFALL for October, 1901 (completed as far as possible), and for November, 1901 (principally from Telegraphic Reports).

STATIONS.	OCTOBER.		NOVEMBER.		STATIONS.	OCTOBER.		NOVEMBER.	
	No. of points. 100 = 1 in.	No. of wet days.	No. of points. 100 = 1 in.	No. of wet days.		No. of points. 100 = 1 in.	No. of wet days.	No. of points. 100 = 1 in.	No. of wet days.
EAST KIMBERLEY:					NORTH-WEST—cont.				
Wyndham ...	Nil	...	432	...	Warrawoan ...	Nil	...	63	5
6-Mile ...	30	1	510	5	Corunna Downs...	...	...	...	...
Carlton ...	...	...	...	...	Nullagine ...	Nil	...	107	...
Denham ...	...	...	...	...	Yandicoogina ...	...	...	...	...
Rosewood Downs	...	...	...	...	Tambourah ...	...	...	...	...
Argyle Downs ...	...	...	...	...	Kerdiadary ...	...	...	...	...
Lisadell ...	...	...	...	...	Roy Hill ...	...	...	...	...
Turkey Creek ...	Nil	...	271	11	Mosquito Creek	...	...	...	...
Plympton, St.	...	...	...	...	Mulga Downs ...	Nil	...	...	...
Mary	...	...	...	...	Woodstock ...	...	...	...	...
Koojabin ...	...	...	...	...	Mt. Florence ...	Nil	...	...	...
Hall's Creek ...	Nil	...	105	...	Tambrey ...	...	...	...	...
Flora Valley ...	...	...	...	...	Millstream ...	...	...	...	...
Ruby Creek ...	...	...	...	...	Mallina ...	Nil	...	...	...
Denizen Downs...	...	...	...	...	Whim Creek ...	Nil	...	Nil	...
WEST KIMBERLEY:					Cooyapooya ...	Nil	...	...	...
Obaguna ...	...	...	...	...	Woodbroke ...	...	...	...	...
Derby ...	Nil	...	91	...	Croydon ...	Nil	...	...	...
Yeeda ...	...	...	...	...	Balla Balla ...	Nil	...	5	1
Liveringa ...	...	...	...	...	Roebourne ...	Nil	...	2	2
Mt. Anderson ...	...	...	...	...	Cossack ...	Nil	...	3	...
Leopold Downs...	...	...	...	...	Fortescue ...	Nil	...	Nil	...
Fitzroy Crossing	Nil	...	52	6	Mardie ...	Nil	...	...	...
Quanbun ...	...	...	...	...	Mt. Stewart ...	...	...	...	...
Nookanbah ...	...	...	...	...	Yarraloola ...	...	...	...	...
Broome ...	Nil	...	Nil	...	Chinginarra ...	Nil	...	...	...
Thangoo ...	...	...	...	...	Onslow ...	Nil	...	Nil	...
La Grange Bay...	Nil	...	12	3	Peedamullah ...	...	...	...	...
NORTH-WEST:					Red Hill ...	Nil	...	...	...
Wallal ...	Nil	...	11	1	Mt. Mortimer ...	...	...	...	...
Condon ...	Nil	...	Nil	...	Wogoola ...	Nil	...	...	...
De Grey River ...	Nil	...	...	...	Nanutarra ...	...	...	...	...
Port Hedland ...	Nil	...	7	1	Yanrey ...	...	...	...	...
Boodarie ...	Nil	...	...	...	Point Cloates ...	Nil	...	...	...
Yule River ...	...	...	...	...	GASCOYNE:				
Warralong ...	Nil	...	...	...	Winning Pool ...	Nil	...	Nil	...
Muccan ...	...	...	...	...	Towara ...	5	1	...	...
Ettrick ...	...	...	...	...	Ullawarra ...	...	...	...	...
Mulgie ...	...	...	...	...	Woorkadjia ...	Nil	...	...	...
Eel Creek ...	...	...	...	...	Thomas Police	...	...	...	...
Coongon ...	...	...	...	...	Station ...	...	...	...	...
Warrawagine ...	...	...	...	...	Bangemall ...	...	...	...	...
Bamboo Creek ...	Nil	...	240	4	Mt. Augustus ...	...	...	...	...
Marble Bar ...	Nil	...	163	...	Minnie Creek ...	...	...	...	...
					Yanyareddy ...	...	...	...	...
					Williambury ...	...	...	...	...

RAINFALL—continued.

STATIONS.	OCTOBER.		NOVEMBER.		STATIONS.	OCTOBER.		NOVEMBER.	
	No. of points. 100 = lin.	No. of wet days.	No. of points. 100 = lin.	No. of wet days.		No. of points. 100 = lin.	No. of wet days.	No. of points. 100 = lin.	No. of wet days.
GASCOYNE—contd.					GASCOYNE—contd.				
Wandagee ...	...	...	...	...	Warracoothara ...	...	...	...	...
Minilya ...	...	...	...	...	Challa ...	26	1	...	...
Boolathana ...	Nil	...	...	...	Youenagabbie ...	Nil	...	...	...
Carnarvon ...	24	3	Nil	...	Murruu ...	Nil	...	...	...
Bernier Island ...	8	3	...	...	Yalgoo ...	4	1	9	2
Cooralya ...	9	1	...	...	Gabyon ...	...	...	...	...
Doorawarrah ...	...	...	...	...	Gullewa ...	5	1	...	...
Mungarra ...	3	1	...	...			
Clifton Downs ...	3	1	...	...	SOUTH-WEST DIVI- SION (NORTHERN PART):				
Dairy Creek ...	...	...	...	...	Murchison House	25	4	...	...
Errivilla ...	...	...	...	...	Mt. View ...	...	...	...	...
Dirk Hartog Island	9	4	...	...	Yuin ...	...	...	...	...
Sharks Bay ...	Nil	...	Nil	...	Northampton ...	94	3	21	1
Kararang ...	...	...	...	...	Mt. Erin ...	58	4	...	...
Meedo ...	...	...	...	...	Oakabella ...	...	...	...	...
Tamala ...	...	...	...	...	Narra Tarra ...	...	...	...	...
Wooramel ...	4	1	Nil	...	Tibbadden ...	40	4	...	...
Hamelin Pool ...	Nil	...	Nil	...	Sand Springs ...	43	4	...	...
Byro ...	3	1	...	...	Mullewa ...	20	1	3	1
Yarra Yarra ...	...	...	...	...	Kockatea ...	20	2	...	...
Berringarra ...	...	...	...	...	Bootenal ...	...	...	...	...
Mt. Gould ...	13	1	...	...	Geraldton ...	25	9	4	...
Moorarie ...	...	...	...	...	Greenough ...	16	3	...	...
Peak Hill ...	35	1	23	...	Dongara ...	62	1	6	1
Horseshoe ...	22	1	...	...	Dongara (Pearse)	64	7	8	1
Abbotts ...	11	2	3	3	Stawberry ...	34	1	...	...
B-lele ...	Nil	...	...	...	Mingenew ...	51	6	7	2
Mileura ...	18	2	...	...	Rothsay ...	12	1	...	...
Milly Milly ...	...	...	...	...	Field's Find ...	19	1	...	...
Manfred ...	10	1	...	...	Carnamah ...	31	3	Nil	...
Meelya ...	30	1	...	...	Watheroo ...	28	4	35	4
Woogorong ...	...	...	...	...	Dandaragan ...	70	4	35	2
Boolardy ...	...	...	...	...	Moora ...	40	4	36	2
Billabalong ...	Nil	...	...	...	Yatheroo ...	116	9	40	3
Wooleano ...	...	...	...	...	Walebing ...	80	7	35	3
Murgoo ...	Nil	...	...	...	New Norcia ...	54	8	76	4
Meeka ...	4	1	...	...			
Mt. Wittenoom ...	5	1	...	...	SOUTH-WESTERN DIVISION, CENTRAL (COASTAL):				
Nannine ...	8	1	50	1	Gingin ...	161	8	83	3
Star of the East ...	5	1	30	1	Belvoir ...	203	9	...	...
Amnean ...	Nil	...	...	...	Mundaring ...	182	9	...	...
Tuckanarra ...	Nil	...	25	1	Guildford ...	224	9	46	4
Coodardy ...	...	...	...	...	Kalhyamba ...	120	10	...	...
Cue ...	2	1	23	2	Canning W't'r'wks	207	9	...	...
Day Dawn ...	Nil	...	25	1					
Lake Austin ...	Nil	...	33	1					
Lennonville ...	23	1	13	1					
Mt. Magnet ...	41	1	14	1					

RAINFALL—continued.

STATIONS.	OCTOBER.		NOVEMBER.		STATIONS.	OCTOBER.		NOVEMBER.	
	No. of points. 100 = in.	No. of wet days.	No. of points. 100 = in.	No. of wet days.		No. of points. 100 = in.	No. of wet days.	No. of points. 100 = in.	No. of wet days.
SOUTH-WEST—contd.					SOUTH-WEST—contd.				
Perth Gardens ...	164	12	44	5	Salvation Army Settlement	63	8	...	...
Perth Observatory	166	12	49	7	Glen Mervyn ...	102	9	...	...
Subiaco ...	177	10	34	2	Dardanup ...	107	10	...	...
Claremont	214	11	52	3	Donnybrook ...	111	6	157	6
Claremont (Richardson):	186	8	...	...	Boyanup ...	100	10	...	...
Fremantle ...	134	14	41	5	Russelton ...	105	14	213	9
Rottneft ...	109	11	59	...	Quindalup ...	132	10	...	...
Armadale ...	160	12	6	2	Margaret River	297	10	...	...
Rockingham	138	8	50	3	Lower Blackwood	220	10	...	...
Canning River	189	11	...	...	Karridale ...	177	15	196	10
Jarrahdale ...	165	9	137	4	Augusta ...	121	8	76	5
Mandurah ...	131	9	104	6	Cape Leeuwin ...	140	18	139	...
Pinjarra ...	169	9	102	5	Biddellia ...	284	13	...	...
Harvey ...	170	10	...	...	The Warren ...	293	11	...	...
					Lake Muir ...	153	13	...	...
SOUTH-WEST, CENTRAL PART (INLAND):					Mordalup ...	140	14	...	...
Goomalling ...	...	...	...	...	Deeside ...	204	12	72	8
Mumberkine ...	48	5	10	2	Riverside ...	204	10	...	...
Culham ...	91	8	23	3	Balbarup ...	185	12	104	6
Newcastle ...	56	5	16	2	Wilgarup ...	166	11	...	...
Eumalga ...	91	6	...	...	Mandalup ...	139	7	...	...
Northam ...	40	4	17	3	Bridgetown ...	124	12	132	7
Grass Valley ...	45	1	...	...	Greenbushes ...	169	12	285	9
Mockering ...	25	2	...	...	Williams ...	57	6	50	6
Cunderdin ...	18	2	...	...	Arthur ...	88	8	38	6
Doongin ...	...	...	...	...	Darkan ...	52	6	...	...
Whitehaven ...	...	...	...	...	Wagin ...	59	6	8	1
Sunset Hills ...	52	3	...	...	Glencove ...	55	6	34	6
Cobham ...	55	5	19	5	Dyliabing ...	84	8	...	...
York ...	33	3	9	1	Katanning ...	99	9	45	7
Beverley ...	41	4	32	1	Kojonup ...	114	6	30	2
Barrington ...	23	5	...	...	Broomehill ...	68	7	31	3
Sunning Hill ...	50	3	47	3	Sunnyside ...	88	9	45	5
Wandering ...	60	6	44	...	Woodyarrup ...	78	7	...	...
Pingelly ...	32	4	21	1	Cranbrook ...	108	8	38	2
Marradong ...	70	5	83	4	Blackwattle ...	74	4	...	...
Bannister ...	55	7	66	5	Mt. Barker ...	282	12	38	7
Narrogin ...	35	4	51	3	Kendenup ...	139	10	36	4
Wickepin ...	36	5	...	...	St. Werburgh's	275	12	...	...
					Forest Hill ...	255	14	...	...
SOUTH-WEST DIVISION (SOUTHERN PART):					Denmark ...	346	11	...	...
Bunbury ...	91	9	168	5	Albany ...	238	14	50	8
Collie ...	66	9	135	...	Point King ...	240	12	45	5
					Breaksea ...	160	10	43	7
					Wattle Hill ...	...	...	...	...
					Cape Riche ...	104	8	...	...
					Pallinup ...	63	9	...	...

RAINFALL--continued.

STATIONS.	OCTOBER.		NOVEMBER.		STATIONS.	OCTOBER.		NOVEMBER.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.		No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
SOUTH-WEST--contd.					EASTERN--contd.				
Bremer Bay ...	254	11	34	5	50-Mile Tank ...	35	1	...	...
Jarramongup ...	...	...	...	...	Norseman ...	39	4	20	3
EASTERN DIVISION:					Bulla Bulling ...	27	...	...	...
Lake Way ...	42	1	...	...	Woolgongie ...	53	1	25	1
Mt. Sir Samuel ...	8	2	16	1	Boorabbin ...	26	3	13	2
Lawlers ...	11	2	89	...	Karalee ...	7	1	...	...
Lake Darlôt ...	...	...	...	...	Yellowdine ...	Nil	...	38	1
Diorite King ...	...	...	...	...	Southern Cross... ..	7	2	12	1
Sturt Meadows... ..	...	...	...	...	Mt. Jackson ...	37	1	25	1
Mt. Leonora ...	9	1	10	2	Bodallin ...	15	3	Nil	...
Mt. Malcolm ...	Nil	...	5	2	Burracoppin ...	13	2	...	...
Mt. Morgans ...	19	1	10	1	Kellerberrin ...	12	1	20	1
Laverton ...	27	2	4	1	Mangowine ...	...	...	...	...
Murrin Murrin... ..	6	1	1	1	Waltoning ...	26	1	...	...
The Granites ...	13	1	8	1	EUCLA DIVISION:				
Tampa ...	2	1	...	...	Raversthorpe ...	146	11	...	...
Niagara ...	10	1	...	...	Coconarup ...	151	10	...	...
Yerilla ...	19	2	...	...	Hopetoun ...	149	16	6	2
Edjudina ...	...	...	...	...	Fanny's Cove ...	246	12	...	...
Menzies ...	16	1	3	1	Park Farm ...	187	13	...	...
Mulline ...	32	1	...	...	Esperance ...	208	12	1	...
Waverley ...	35	1	30	1	Gibson's Soak ...	123	5	...	...
Goongarrie ...	31	1	12	1	30-Mile Condenser	158	6	...	...
Mulwarrie ...	40	1	33	1	Swan Lagoon ...	129	13	...	...
Kurawa ...	48	1	15	1	Grass Patch ...	87	12	...	...
Dixie Gold Mine	47	2	19	2	Myrup ...	186	13	...	...
Kurnalpi ...	33	3	10	2	Lynburn ...	...	...	...	...
Bulong ...	65	3	9	1	Boyatup ...	175	7	...	...
Kanowna ...	63	2	14	1	Middle Island ...	161	12	...	...
Kalgoorlie ...	49	1	15	2	Point Mulcoln ...	114	9	...	...
Coolgardie ...	19	1	33	...	Israelite Bay ...	113	5	27	3
Burbanks P.O. ...	14	1	21	2	Frazer Range ...	82	3	...	...
Burbanks Birth- day Gift	15	1	23	1	Southern Hill ...	77	2	...	...
Woolubar ...	30	1	...	...	Balladonia ...	63	5	37	...
Widgiemooltha... ..	42	2	22	2	Eyre ...	114	...	47	...
					Eucla ...	110	7	64	3

The Observatory, Perth,
4th December, 1901.

W. E. COOKE,
Government Astronomer.

Return of Fruit imported into Western Australia during November, 1901.

NAME OF PORT.	No. of Ships.	No. of Coun- ments Inspected.	Total No. of Cases.	No. of Cases Passed.	No. of Cases Prohibited.	No. of Cases Destroyed.	No. of Cases in Quarantine.	No. of Cases Dipped.	No. of Cases of													All other Fruits.		
									Apples.	Apricots.	Bananas.	Cherries.	Gooseberries.	Lemons.	Nectarines.	Oranges.	Passion Fruit.	Pears.	Plums.	Rhubarb.	Strawberries.		Ponoloes.	Pines.
FREMANTLE	25	130	15628	13046	2488	2488	..	15628	798	..	2661	384	416	2245	..	6346	17	..	115	29	7	18
ALBANY	9	10	479	454	25	25	..	479	6	..	33	35	35	47	..	203	20	14	6	52
GERALDTON	1	2	11	11	..	..	..	11	..	..	..	..	..	..	..	..	..	..	..	..	11	..	..
HAMELIN	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
BUSSELTON	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
BUNBURY	1	1	37	37	..	..	..	37	..	..	..	..	..	25	..	12	..	..	..	..	..	..	..
ESPERANCE	2	2	18	18	..	..	..	18	18	..	..	..	..	..	..	..	..	..	..	..	..	..	..
TOTAL	38	145	16173	13566	2513	2513	..	16173	822	..	2804	429	451	2317	..	6561	17	..	135	14	..	40	13	70

Department of Agriculture,
9th December, 1901.

Return of Fruit Trees and Plants imported into Western Australia during November, 1901.

NAME OF PORT.	No. of Ships.	No. of Consignments, of Trees or Plants.	Total No. of Trees or Plants in such (consignments).	No. of (consignments pushed.	Total No. of Trees or Plants in such (consignments).	No. of (Consignments prohibited. of Trees or Plants	Total No. of Trees or Plants in such (Consignments).	No. of Packages dipped.	No. of Trees.																			
									Ornamental and Pot Plants.	Almonds.	Apples.	Apricots.	Cherries.	Figs.	Lemons.	Mangoes.	Mulberries.	(Pomegranates.)	Pears.	Plums.	Small Fruits.	Vine Cuttings.	All other Trees.					
BREMEN	2	2	26	2	26	:	:	2	26	26	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	26
ALBANY	...	...	...	...	...	:	:	...	...	...	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	...
GERALTON	...	...	...	...	...	:	:	...	...	...	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	...
HAMELIN	...	...	...	...	...	:	:	...	...	...	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	...
BUSSELTON	...	...	...	...	...	:	:	...	...	...	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	...
BUNBURY	...	...	...	...	...	:	:	...	...	...	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	...
ESPERANCE	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	...
TOTAL	2	2	26	2	26	:	:	2	26	26	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	26

Department of Agriculture,
9th December, 1901.

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LEVI GREEN



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